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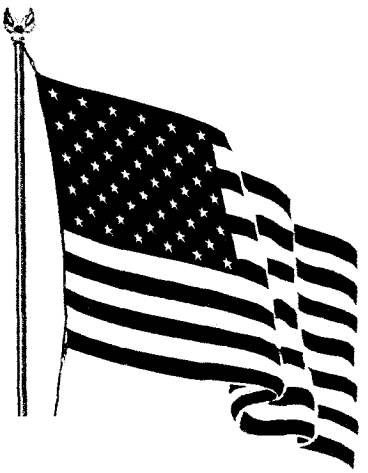

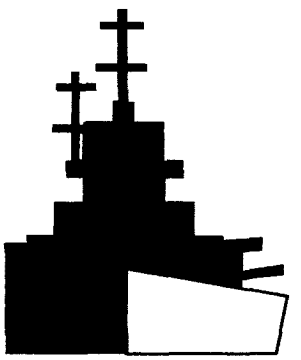

FINAL
WORK PLAN FOR REMEDIAL INVESTIGATION
IR SITE 35, AREAS OF CONCERN IN
TRANSFER PARCEL EDC-5
ALAMEDA POINT
ALAMEDA, CALIFORNIA

CTO-0077/0040-1
March 2006

Submitted to:

Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
WORK PLAN FOR REMEDIAL INVESTIGATION
IR SITE 35, AREAS OF CONCERN IN
TRANSFER PARCEL EDC-5
ALAMEDA POINT
ALAMEDA, CALIFORNIA

CTO-0077/0040-1
March 2006

Prepared by:

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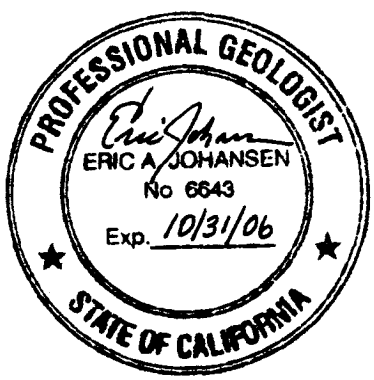

Signature: Eric Johansen Date: 3/13/06
Eric Johansen, PG 6643, CTO Leader

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CLEAN 3 TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N-68711-95-D-7526 **Document Control No.** CTO-0077/0040-1

File Code. 0214

TO: Contracting Officer
NAVFAC Southwest
Ms. Graciela R. Steinway, AQE.GS
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: March 14, 2006
CTO #: 0077
LOCATION: Alameda, California

FROM: Janet L. Argyres, Project Manager

DESCRIPTION: **Replacement Pages** - Final Work Plan for Remedial Investigation, IR Site 35, Areas of Concern in Transfer Parcel EDC-5, Dated March 2006

TYPE: Contract Deliverable (Cost) ___ CTO Deliverable (Technical) X Other ___

VERSION: Final (e.g., Draft, Draft Final, Final, etc.) REVISION #: 1

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March 14, 2006

Contracting Officer
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Ms. Graciela R. Steinway, AQE.GS
1220 Pacific Highway
San Diego, CA 92132-5190

Subject: **Replacement Pages** - Final Work Plan for Remedial Investigation
IR Site 35, Areas of Concern in Transfer Parcel EDC-5
Alameda Point, Alameda, California
Dated March 2006

Dear Ms. Steinway:

Enclosed, please find 6 copies of the replacement pages for the Final Work Plan for Remedial Investigation, IR Site 35, Areas of Concern in Transfer Parcel EDC-5, Alameda Point, Alameda, California, dated March 2006. As directed by the Navy RPM, we are concurrently transmitting copies to Ms. Anna-Marie Cook and Ms. Sophia Serda of U.S. EPA; Ms. Dot Lofstrom, Ms. Michelle Dalrymple, and Mr. Jim Polisini of DTSC; and Ms. Judy Huang of the RWQCB. In addition, we are forwarding copies on behalf of the Navy to the parties listed on the attached transmittal sheet.

If you have any questions, please contact Eric Johansen, CTOL, at (619) 744-3091 or me at (415) 768-9917.

Very truly yours,

Janet L. Argyres
Project Manager

JLA/EJ/sp

Enclosure

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CLEAN 3 TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N-68711-95-D-7526 **Document Control No.** CTO-0077/0040

File Code. 0214

TO: Contracting Officer
NAVFAC Southwest
Ms. Graciela R. Steinway, AQE.GS
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: January 26, 2006
CTO #: 0077
LOCATION: Alameda, California

FROM: _____
Janet L. Argyres, Project Manager

DESCRIPTION: Draft Final Work Plan for Remedial Investigation, IR Site 35, Areas of Concern in Transfer Parcel EDC-5, Dated January 2006

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VERSION: Draft Final (e.g., Draft, Draft Final, Final, etc.) REVISION #: 0

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D. Silva, EVR.DS (3C/3E)*	PDCC Files (1C/1E)*	M. Liao (1C/1E)	DTSC
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CLEAN 3 Program
Bechtel Job No. 23818
Contract No. N68711-95-D-7526
File Code: 0214

IN REPLY REFERENCE: CTO-0077/0040

January 26, 2006

Contracting Officer
NAVFAC Southwest
Ms. Graciela R. Steinway, AQE.GS
1220 Pacific Highway
San Diego, CA 92132-5190

Subject: Draft Final Work Plan for Remedial Investigation
IR Site 35, Areas of Concern in Transfer Parcel EDC-5
Alameda Point, Alameda, California
Dated January 2006

Dear Ms. Steinway:

Enclosed, please find 6 copies of the Draft Final Work Plan for Remedial Investigation, IR Site 35, Areas of Concern in Transfer Parcel EDC-5, Alameda Point, Alameda, California, dated January 2006. As directed by the Navy RPM, we are concurrently transmitting copies to Ms. Anna-Marie Cook and Ms. Sophia Serda of U.S. EPA; Ms. Marcia Y. Liao, Ms. Michelle Dalrymple, and Mr. Jim Polisini of DTSC; and Ms. Judy Huang of the RWQCB. In addition, we are forwarding copies on behalf of the Navy to the parties listed on the attached transmittal sheet.

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Janet L. Argyres
Project Manager

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ATTACHMENTS

Attachment

ACRONYMS/ABBREVIATIONS

AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
B(a)P	benzo(a)pyrene
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
BSU	Bay Sediment Unit
CAA	corrective action area
Cal. Code Regs.	*California Code of Regulations*
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	*Code of Federal Regulations*
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	contract task order
DGI	data gap investigation
DQO	data quality objective
DTSC	(Cal/EPA) Department of Toxic Substances Control
EBS	environmental baseline survey
EDC	economic development conveyance
EE/CA	engineering evaluation/cost analysis
ERV	ecological reference value
°F	degrees Fahrenheit
FS	feasibility study
FWBZ	first water-bearing zone
HHRA	human-health risk assessment
IR	Installation Restoration (Program)
LBP	lead-based paint
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
MSL	mean sea level
NAS	Naval Air Station
National Register	National Register of Historic Places

OU	operable unit
OWS	oil/water separator
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEP	parcel evaluation plan
PG	Professional Geologist
PRG	preliminary remediation goal
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RWQCB	(San Francisco Bay) Regional Water Quality Control Board
§	section
SAP	sampling and analysis plan
SI	site inspection
SWBZ	second water-bearing zone
SWMU	solid waste management unit
TCRA	time-critical removal action
tit.	title
TPH	total petroleum hydrocarbons
U.S.C.	*United States Code*
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

Section 1
INTRODUCTION

This Work Plan describes the procedures for characterizing soil and groundwater at Installation Restoration (IR) Site 35, Areas of Concern (AOCs) in Transfer Parcel Economic Development Conveyance (EDC)-5, Alameda Point (formerly Naval Air Station [NAS] Alameda), Alameda, California. Bechtel Environmental, Inc. (BEI), prepared this Work Plan for the Base Realignment and Closure Program Management Office West under Contract Task Order (CTO)-0077 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program, Contract No. N68711-95-D-7526. This work is follow-on to work conducted under CTO-0067, under which a final Site Inspection (SI) Report was prepared (BEI 2005b).

The locations of Alameda Point and IR Site 35 are presented on Figures 1-1 and 1-2, respectively. IR Site 35 comprises numerous areas within Transfer Parcel EDC-5. Twenty-five AOCs were identified for further evaluation in the SI Report (BEI 2005b; Figure 1-2). Subsequent to issuing the SI Report, the list of areas requiring further evaluation was refined by the Navy and regulatory agencies in four planning meetings held May through July 2005. Polynuclear aromatic hydrocarbon (PAH) areas were also added to IR Site 35 in response to comments on the draft Work Plan from United States Environmental Protection Agency (U.S. EPA) and California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC). It was agreed that the following study areas would be subject to further evaluation at IR Site 35:

- 23 of the 25 AOCs identified in the SI Report
  - 2 AOCs (AOCs 19 and 22) were removed from IR Site 35 and included with adjacent IR Site 6 and Corrective Action Area (CAA) B, respectively
  - 19 AOCs (AOCs 1, 2, 3, 5, 6, 8 through 13, 15, 17, 18, 20, 21, 23, 24, and 25) require additional sampling and analysis
  - 4 AOCs (AOCs 4, 7, 14, and 16) have sufficient data to perform baseline human-health risk analyses
- 3 data gap areas
  - Environmental Baseline Survey (EBS) Parcel 78
  - EBS Parcel 79
  - EBS Parcel 205
- 9 solid waste management units (SWMUs)
  - 1 oil/water separator (OWS) (OWS 017); OWS 611 was also identified as a SWMU; however, the SWMU Report found that this OWS does not exist, and the Navy requested that it be removed from the SWMU list (SulTech 2005a)
  - 7 aboveground storage tanks (ASTs) (ASTs 016, 039, 152, 173A, 173B, 173C, and 392)
  - 1 underground storage tank (UST) (UST[R]-11, also known as Tank 393)

- PAH areas
  - PAH areas identified for inclusion in the FS address residual benzo(a)pyrene (B[a]P) equivalent concentrations that are above the Alameda Point screening criterion of 620 micrograms per kilogram (µg/kg) but do not drive risk above 10^{-5}. No additional samples are proposed in the PAH areas that are outside of AOCs. Also, as agreed upon with U.S. EPA on November 14, 2005, baseline risks will not be calculated for the PAH areas.

The boundaries of some areas of IR Site 35 shown on Figure 1-2 may need to be revised based on the RI/FS results. Also, AOCs that were identified solely because of the presence of PAHs may be incorporated into the PAH areas.

DTSC also identified lead-based paint, chlordane, and sanitary and industrial waste sewer lines as outstanding issues, and requested a comparison of detection limits from previous sampling results with RI comparison criteria. The Navy has policies for addressing the first two issues and will follow these policies. The last issue, along with the comparison of detection limits with RI criteria, will be addressed during the RI, and results will be presented in the RI report. The Navy and agencies will assess whether additional samples will be needed to resolve these issues and determine the best timing to collect data, considering the transfer schedule.

The Navy is aware that contaminated groundwater from adjacent IR sites may have impacted areas within IR Site 35. The Navy will address this groundwater contamination as part of the existing CERCLA program IR sites including IR Sites 3, 4, and 21 (Operable Unit [OU]-2B); IR Site 5 (OU-2C); IR Sites 6, 7, and 8 (OU-1); and IR Sites 26 and 28 (OU-6).

Environmental concerns that have been identified at IR Site 35 are summarized in Table 1-1.

This Work Plan and its attachments have been prepared in accordance with the following guidance:

- Guidance for Conducting RIs and FSs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. EPA 1988)
- Guidance for the Data Quality Objectives (DQOs) Process (U.S. EPA 2000)
- Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods (U.S. EPA 2005)
- U.S. EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (U.S. EPA 2001)

1.1 PROJECT PURPOSE

The Navy is currently in negotiations to transfer land at Alameda Point for redevelopment. In order to transfer base property, the Navy must conform to the requirements of CERCLA Section 120(h) for closing military bases. Transfer Parcel EDC-5 has been identified for early transfer. To facilitate early transfer of Transfer Parcel EDC-5, the RI and FS process for IR Site 35 is being performed on an accelerated schedule.

The purpose of the RI is to characterize the nature and extent of contamination in soil and groundwater at IR Site 35 in order to assess risk to human health. Analytical results will also provide a basis on which to evaluate the types of response actions to be considered in the FS and to support the property transfer process.

This Work Plan and its supporting attachments describe the objectives, scope, rationale, procedures, and methods that will be used to perform RI activities at IR Site 35. The Sampling and Analysis Plan (SAP) (Attachment A) describes the rationale and methodology for conducting the RI field activities at each of the IR Site 35 study areas. DQOs were prepared in accordance with U.S. EPA DQO guidance (U.S. EPA 2000). DQOs developed for the IR Site 35 investigation are discussed in detail in Section 1.4 of the SAP and are presented in SAP Tables 1-2, 1-3, and 1-4.

1.2 SCOPE OF EFFORT

The following field activities are proposed to meet the RI objectives. Details are summarized in Table 1-5 of the SAP and described in Appendix A1 to the SAP.

- Collect soil samples using a direct-push drill rig or hand auger.
- Collect sediment samples from catch basins or storm sewer manholes downflow from AOC 12.
- Collect groundwater samples from the direct-push borings or existing groundwater monitoring wells within the first water-bearing zone (FWBZ).

In response to regulatory agency requests, borings were added to those proposed in the draft Work Plan, and samples targeting specific features (e.g., an AST or OWS) will be located as close to the feature as possible. Analytical data for soil and groundwater will be used to interpret the nature and extent of contamination at IR Site 35. Data from adjacent IR sites will also be reviewed to assess whether contaminants are associated with these sites or historical IR Site 35 activities.

Area-specific human-health risk assessments (HHRAs) will be conducted to evaluate potential risk to human health. U.S. EPA agreed in a November 14, 2005, conference call that baseline risks would not need to be calculated for the PAH areas. As discussed in Section 2.9, no ecological assessment of terrestrial receptors will be conducted because of the lack of suitable habitat and the absence of threatened, endangered, or special-status species at IR Site 35. Groundwater results for study areas adjacent to or near surface water (i.e., AOCs 2, 3, 4, 20, 21, and the southern portion of 23; and EBS Parcel 205) will be compared to criteria for aquatic receptors.

To facilitate the accelerated project schedule, results of the RI will be presented in a combined RI/FS report.

1.3 WORK PLAN ORGANIZATION

This Work Plan includes the following five sections and five supporting attachments.

- Section 1 presents an overview of the Work Plan document and the purpose and scope of the RI.

- Section 2 provides the site history and a site description.
- Section 3 provides a discussion of previous investigations at the site.
- Section 4 presents the preliminary identification of applicable or relevant and appropriate requirements (ARARs).
- Section 5 lists the references that are cited in text.
- Attachment A is the SAP (includes the Field Sampling Plan and the Quality Assurance Project Plan). The SAP provides procedures for collecting soil and groundwater samples, details the analytical methods that will be used, and specifies the quality assurance goals for the analytical methods used.
  - Appendix A1 to the SAP provides area-specific descriptions, histories, and proposed sampling rationales.
  - Appendix A2 to the SAP includes electronic tables (on a compact disk) that summarize previous data collected within each IR Site 35 area.
- Attachment B is the Data Management Plan, which details procedures to assure that timely data reports are received, reviewed, and readily accessible for use.
- Attachment C is the Investigation-Derived Waste Management Plan.
- Attachment D is the Site-Specific Safety and Health Plan Supplement.
- Attachment E is the HHRA Work Plan.
- Appendix F contains responses to comments on the draft Work Plan.

Figures and tables are presented at the end of this Work Plan.

1.4 PROJECT TEAM

Successful implementation of RI activities will be a collaborative effort between representatives of the Navy and regulatory agencies, along with the CLEAN Program team. The principal decision makers are the Navy and their regulatory agency partners. Detailed information about the project team is provided in the SAP (Attachment A), as follows.

- The names, roles, and contact information for the Navy and CLEAN Program team are provided in Table 1-1 in the SAP.
- The organization and relationships of the Navy and the team members are illustrated on Figure 1-1 in the SAP.

Regulatory agency representatives include project managers from the U.S. EPA Region 9, DTSC, and San Francisco Bay Regional Water Quality Control Board (RWQCB). U.S. EPA is the lead regulatory agency overseeing IR Program activities.

Section 2
SITE DESCRIPTION AND HISTORY

This section presents background information for Alameda Point and IR Site 35. Topics discussed include site description, history, physical setting, and demographics, as well as a summary of ecological, natural resource, and historical features.

2.1 ALAMEDA POINT DESCRIPTION AND BASE HISTORY

The Navy is currently in negotiations to transfer land at Alameda Point for redevelopment. In 1930, the U.S. Army acquired the original base property from the City of Alameda and began construction activities in 1931. In 1936, the Navy acquired title to the land from the Army and began building an air station in response to the military buildup in Europe before World War II. Construction of the base included the filling of tidelands, marshlands, and sloughs with dredge materials from the San Francisco Bay. The base was operated as an active naval facility from 1940 to 1997.

NAS Alameda and its two major tenants, the Navy Public Works Center and Naval Aviation Depot Alameda, conducted a variety of operations at Alameda Point. These included aircraft, engine, gun, and avionics maintenance; engine overhaul and repair; fueling activities; and plating, stripping, and painting activities. The Navy Public Works Center also operated two power plants, a transportation shop, and a pesticide shop at Alameda Point. In addition, the base operated a deepwater port capable of berthing aircraft carriers. The deepwater port was also used for minor ship maintenance. The following tenants also occupied Alameda Point during its tenure as an active military base:

- Construction Battalion Unit 416
- Commander Naval Air Force, U.S. Pacific Fleet Material Representative
- Defense Property Disposal Office
- Navy Disease Vector Ecology Control Center
- Alameda Detachment, Explosive Ordnance Disposal Group One
- Marine Air Group 42
- Naval Air Reserve Unit
- Naval Regional Dental Center Branch Clinic
- Naval Regional Medical Center Branch Clinic
- Pacific Fleet Audio-Visual Facility Component
- Shore Intermediate Maintenance Activity
- Supervisor of Shipbuilding, Conversion, and Repair

In September 1993, NAS Alameda was designated for closure by United States Congress and the Base Realignment and Closure Commission. NAS Alameda ceased naval operations in April 1997. The Navy is currently in the process of returning the land to the City of Alameda and federal government agencies. The Navy and the City of Alameda are working with the Alameda Reuse and Redevelopment Authority to determine

appropriate reuse options. On July 22, 1999, Alameda Point was placed on the National Priorities List (64 *Federal Register* 140, 39878–39885, Final Rule, July 22, 1999). The Comprehensive Environmental Response, Compensation, and Liability Information System identification number for NAS Alameda is CA2170023236.

2.2 SITE DESCRIPTION

IR Site 35 consists of numerous areas within Transfer Parcel EDC-5 that total approximately 50 acres in the northeastern portion of Alameda Point (Figure 2-1). These areas were identified for further evaluation by the Navy and regulatory agencies. IR Site 35 is generally bounded by Oakland Inner Harbor on the north, Main Street on the east, Transfer Parcel EDC-10 and Seaplane Lagoon on the south, and Transfer Parcels EDC-7, EDC-9, EDC-15, and Public Benefit Conveyance-1A on the west. IR Site 3 Group (IR Sites 3, 4, 11, and 21), and IR Sites 5, 6, 7, 8, 12, 26, and 28 are adjacent. Groundwater and/or soil at IR Site 35 may be impacted from adjacent IR Site 3 Group and IR Sites 5, 6, and 7.

IR Site 35 consists of open space (grassy, gravel, or paved areas with no buildings present), residences, and commercial/industrial buildings. Historical uses of the site by the Navy were industrial, residential, and recreational. These uses included living quarters; a soccer field; medical facilities; aircraft storage, flight testing, and maintenance facilities and associated taxiways, runways, and terminal; offices; educational buildings; parking; grounds maintenance; a golf course; a jail; water towers; a heating plant; painting and sandblasting facilities; an engineering laboratory; electrical substations; smelting operations; hobby shops; a liquid oxygen/nitrogen facility; dog training and kenneling facilities; a plant nursery; material storage areas; communications towers; hazardous materials storage; chemical storage; fuel storage tanks; and oil/water separators.

2.3 CLIMATE

The San Francisco Bay area is characterized by a Mediterranean climate with mild summer and winter temperatures. The mean annual precipitation at Alameda Island is 23 inches, with most of the precipitation generally occurring from October to April. Mean yearly low and high temperatures are 52 degrees Fahrenheit (°F) and 67 °F, respectively. The wind direction is predominantly from the west or northwest, with rare occurrences of gale-force or greater winds. Heavy fog that sometimes impairs visibility for navigation occurs on an average of 21 days per year (NWS 2001). Table 2-1 summarizes maximum and minimum monthly temperatures and average rainfall totals.

2.4 TOPOGRAPHY

Alameda Island lies at the base of a gently westward-sloping plain that extends from the Oakland-Berkeley Hills in the east to the shore of the San Francisco Bay in the west. Alameda Island has a low topographic profile, with surface elevations varying from mean sea level (MSL) to approximately 30 feet above MSL. The topography of IR Site 35 is primarily flat and rises to approximately 10 feet above MSL (Figure 2-2).

2.5 GEOLOGY

Alameda Island sedimentary deposits consist of five units (Figures 2-2 and 2-3). From oldest to youngest, they are the Franciscan Formation, Alameda Formation, San Antonio Formation (lower and upper units), Merritt Sand Formation, and Bay Sediment Unit (BSU). The sedimentary units overlie bedrock consisting of metamorphosed sandstone, siltstone, shale, graywacke, and igneous bedrock of Jurassic to Cretaceous age, representative of the Franciscan Formation (Rogers and Figuers 1991). A summary of the sedimentary units overlying the Franciscan Formation and a description of the marsh crust and artificial fill material are presented in the following subsections.

2.5.1 Artificial Fill Material

Most of the sedimentary deposits at Alameda Point are overlain by fill material. Fill material thickness generally decreases from west to east across Alameda Point. Up to 40 feet of fill is present at the western margin of Alameda Point, where offshore areas were reclaimed to create new land. As little as 3 to 5 feet of fill material is present at the eastern margin of Alameda Point, where tidal marshes and estuarine channels were reclaimed. The fill material is predominantly poorly graded, fine-to-medium-grained sand with silt and clay.

The fill layer at IR Site 35 was observed in borings drilled from the ground surface to 4 to 9 feet below ground surface (bgs). Descriptions of the fill samples taken from boring logs ranged from fine- to coarse-grained sands and silty-to-sandy clays (BEI 2004). Depth to the Young Bay Mud, where encountered, ranged from 4 to 9 feet bgs (BEI 2004).

2.5.2 Marsh Crust

In the eastern portion of Alameda Point, a marsh crust horizon (2 to 6 inches thick), which exists just beneath the fill layer and overlies the BSU, appears to be present beneath most of IR Site 35 (Figure 2-3). The marsh crust was impacted by petroleum-related chemicals, including semivolatile organic compounds (SWDIV 2001). A Remedial Action Plan/Record of Decision has been written for the marsh crust and has been signed and approved by the Navy, U.S. EPA, and Cal/EPA (SWDIV 2001).

2.5.3 Bay Sediment Unit

The BSU, which underlies the marsh crust horizon (where present), consists of an upper and a lower unit. The upper unit is referred to as the Young Bay Mud, an estuarine deposit consisting of stiff, dark, olive-gray clay with discontinuous silty and clayey sand layers. Where present, the upper BSU is a semiconfining unit between the FWBZ and second water-bearing zone (SWBZ) at Alameda Point. The lower unit of estuarine deposits consists of silty sand with interbedded layers of fine sand.

2.5.4 Merritt Sand Formation

Beneath most of Alameda Point, the Merritt Sand Formation underlies the BSU. The Merritt Sand Formation is composed of eolian deposits of a brown, poorly graded, fine-to-medium-grained sand.

2.5.5 San Antonio Formation

The San Antonio Formation consists of an upper unit and lower unit. The upper unit is made up of alluvial deposits (interbedded layers of sand and clay). The lower unit is the Yerba Buena Mud (Old Bay Mud). It is composed of estuarine deposits and is known to be an effective and regionally continuous hydraulic barrier (aquitard) and confining layer above the underlying Alameda Formation (a regional aquifer) (TtEMI 2000b). No direct evidence of depositional interconnection between the sands of the Merritt Sand Formation and the Alameda Formation has been identified. Borehole lithologic description indicates that 55 to 90 feet of low-permeability Yerba Buena Mud underlies Alameda Point (TtEMI 2000b).

2.5.6 Alameda Formation

The Alameda Formation, which underlies the San Antonio Formation, has an upper and lower unit. The upper unit consists of clay-rich marine deposits, and the lower unit includes alluvial deposits. The principal regional aquifer is composed of coarse deposits of the lower portion of the Alameda Formation. The Alameda Formation overlies the Franciscan Formation.

2.6 HYDROGEOLOGY

The hydrostratigraphic units beneath the central region (containing IR Site 35) of Alameda Point are described in the following subsections.

2.6.1 First Water-Bearing Zone

The FWBZ is an unconfined aquifer composed of artificial fill material. Based on observations in borings from previous investigations at Transfer Parcel EDC-5 (which encompasses IR Site 35), depth to groundwater ranged from approximately 2.5 to 7 feet bgs; groundwater elevation ranged from approximately 3 to 7.5 feet above MSL.

Shallow groundwater at Alameda Point generally flows from central areas toward the shorelines. Basewide and site-specific groundwater elevation maps are provided on Figures 2-4 and 2-5, respectively. Groundwater flow direction in the center of IR Site 35 is uncertain. Groundwater elevation data collected as part of the on-going basewide groundwater monitoring program will be reviewed as part of the RI.

2.6.2 Bay Sediment Unit

The upper portion of the BSU is a semiconfining layer composed of estuarine deposits consisting of silty and clayey sand. This layer acts as a hydraulic barrier between the

FWBZ and the SWBZ. Vertical communication between the FWBZ and the SWBZ is believed to be minimal in the central region of Alameda Point.

2.6.3 Second Water-Bearing Zone

The SWBZ is a semiconfined aquifer composed of the lower portion of the BSU, the Merritt Sand Formation (where present), and the upper unit of the San Antonio Formation. It is sometimes referred to as the Merritt Sand aquifer and yields saline water (20,000 to 35,000 milligrams per liter). The proximity of the Merritt Sand to San Francisco Bay contributes to the presence of salt water in the aquifer. The Merritt Sand aquifer, exposed in the channel and port areas, is considered to be in direct communication with the water of San Francisco Bay. This aquifer is the conduit for saltwater intrusion along the Oakland Inner Harbor and Seaplane Lagoon to the lower portion of the FWBZ and the entire SWBZ beneath Alameda Point (DWR 1960, TtEMI 2000b).

2.6.4 San Antonio Aquitard

The San Antonio (Yerba Buena Mud) aquitard is thick and continuous throughout the entire Alameda Point and acts as an effective hydraulic barrier between the SWBZ and the underlying Alameda Formation. The San Antonio aquitard is approximately 55 to 90 feet thick across Alameda Point (Hickenbottom and Muir 1988).

2.6.5 Alameda Aquifer

The Alameda aquifer is the principal regional freshwater aquifer. Depth to the top of the Alameda aquifer ranges from 180 feet bgs at Alameda Point to 220 feet beneath the surface of the sediment in Oakland Inner Harbor. The thickness of the formation is between 230 and 800 feet (Hickenbottom and Muir 1988).

2.7 FILL HISTORY

Before 1850, the peninsula of Alameda consisted of approximately 2,200 acres of high ground (dry land) and approximately 1,000 acres of marshland. The peninsula measured approximately 4.5 by 1.5 miles and consisted of only the eastern portion of present-day Alameda Island. Alameda Peninsula became an island when the San Leandro Channel was dredged; this dredging was completed in 1902 (Lenhart 2005). As a result of fill projects conducted between 1871 and 1961, Alameda Island is now three times its original size. The general trend of fill events was to initially reclaim areas north of Atlantic Avenue and then reclaim areas west of Main Street (Figure 2-6). Currently, Alameda Island consists of approximately 6,912 acres of dry land (Valeska, pers. com. 2001).

In 1930, the U.S. Army acquired the western portion of Alameda Island, now referred to as Alameda Point, and began construction activities in 1931. In 1936, the Navy acquired the land from the U.S. Army and began building NAS Alameda. The U.S. Army and Navy construction activities both involved filling tidelands, marshes, and sloughs between the Oakland Inner Harbor and the western edge of Alameda Island. The fill

material largely consisted of dredge spoils from the surrounding San Francisco Bay and Oakland Inner Harbor. After 1941, the Navy acquired additional land, extending the western edge of the base.

The northeastern portion of IR Site 35 was created by filling tidal flats between 1859 and 1930, before Navy occupancy. Between 1930 and 1936, an additional portion of the site was reclaimed in conjunction with the construction of the Alameda Municipal Airport and the expansion of Benton Field. The final fill activity in IR Site 35 occurred between 1936 and 1945, when approximately 1.5 million cubic yards of sand was pumped from the San Francisco Bay to fill large portions of NAS Alameda (Merlin 1977, Vigness 1952).

2.8 DEMOGRAPHICS AND PLANNED FUTURE USE

The City of Alameda consists of Alameda Island and Bay Farm Island (Figure 1-2). The City of Alameda is an urban community with an estimated area of 11 square miles that has approximately 72,500 residents and 6,000 businesses (United States Census Bureau 2000). Several residences and businesses are located in IR Site 35.

IR Site 35 will be transferred by the Navy to the City of Alameda. The land included in IR Site 35 was formerly used by the Navy for industrial, residential, and recreational activities. The site falls within three distinct future land-use areas identified by the Alameda Point Reuse Plan: Civic Core, Main Street Neighborhood, and Marina areas (LSA 2001). The Civic Core area represents the area that previously served as the central administrative and industrial core of NAS Alameda. According to the Alameda Point Reuse Plan, the Civic Core area is slated to be a mixed-use area consisting of light industrial, office, civic, residential, educational, recreational, and commercial uses. The Main Street Neighborhood area predominantly represents former Navy housing areas. Based on the Reuse Plan, this area will continue to be used for housing and community-oriented uses. The Marina area consists of the land surrounding Seaplane Lagoon. This area was predominantly used as part of a paved taxiway system and contains piers used to moor aircraft carriers and other naval vessels. Specified allowable uses for the planned Marina area include marina, marina-related industry, and office, civic, commercial, residential, recreational, and supporting retail uses.

2.9 ECOLOGICAL HABITATS AND NATURAL RESOURCES

The following subsections describe ecological habitats, potentially sensitive habitats, and special-status species at IR Site 35. The ecological information presented in this subsection is based on a review of previously prepared environmental documents (City of Oakland 2002; LSA 2001, 2002; Parsons 2001; USACE and Port of Oakland 2000; USACE 1998; WRT 2002).

2.9.1 Ecological Habitats

The northern portion of IR Site 35 is characterized as an urban habitat (Figure 2-7). The vegetation in urban habitat areas is characterized by ornamental species and other nonnative species in landscaped lawns and parks. The lawns and parks provide nesting sites and foraging areas for typical urban wildlife, including western scrub jay, house

finch, American robin, and the California ground squirrel. Other wildlife potentially present in the northern portion of IR Site 35 includes raptors and other foraging predators, bats inhabiting abandoned buildings, and feral cats (LSA 2001). Urban habitat generally supports few wildlife species due to human disturbances and limited vegetation.

The southern portion of IR Site 35 is considered an intensively developed area (Figure 2-7) and is characterized as a barren habitat. The intensively developed southern portion of IR Site 35 has little to no vegetation; it consists primarily of buildings, roads, and parking lots. Typical urban wildlife may also be found in a barren habitat, usually as a result of moving between other preferred habitats.

2.9.2 Potentially Sensitive Habitats

An annual roosting site of monarch butterflies (*Danaus plexippus*), a potentially sensitive habitat located in a park-like area between Barber's Point Road and Pearl Harbor Road, is approximately 250 feet southwest of AOC 5 (LSA 2001; Figure 2-7). The monarch butterfly is considered a regionally important species and is protected under the California Environmental Quality Act. Monarch butterflies may seasonally use a grove of Monterey pine, stone pine, and eucalyptus trees as an autumnal roost during annual migration to overwintering sites (areas where the butterflies hibernate throughout the winter). Monarch butterflies cluster in the same areas (and often the same trees) each fall, and during the fall migration may roost for a few weeks or months as they pass through the area. Removal or alteration of groves providing an autumnal roost may disrupt the life cycle of a particular group of monarch butterflies (LSA 2001). Since the monarch butterflies do little other than travel during the migration period, it is unlikely that any site characteristics will affect the butterflies except for providing pine and eucalyptus trees for roosting.

There are no wetlands located in IR Site 35 (LSA 2001).

2.9.3 Special-Status Species

No special-status species are known or suspected to occur at IR Site 35 except for the special-status bats that are suspected to roost in abandoned buildings and forage in the adjacent areas of grassland or scrub habitat. Therefore, the bats would likely have no direct contact with soil or groundwater in IR Site 35.

Special-status birds may occasionally be observed at the urban or barren habitats of IR Site 35. However, IR Site 35 offers little value to wildlife and likely serves only as a corridor between other preferred habitats.

2.9.4 Ecological Summary

At IR Site 35, only barren habitat and urban habitat currently exist. There are no ponds, streams, or wetlands located at the site. Due to the absence of threatened or endangered species and negligible exposure potential for other special-status species at IR Site 35, no further ecological investigation was recommended in the SI Report (BEI 2005b), and therefore, no terrestrial ecological assessment will be performed. As stated in the data

quality objectives for the SAP (Table 1-2 in Attachment A), groundwater results for study areas adjacent to or near surface water (e.g., AOCs 2 and 4 and EBS Parcel 205) will be compared to aquatic criteria.

2.10 HISTORICAL FEATURES

In 1992, prior to the closure of NAS Alameda, the Navy retained an architectural historian to survey all buildings on the military base constructed prior to 1946 and assess their potential significance. The survey determined that while no individual buildings appeared to be eligible for listing in the National Register of Historic Places (National Register), a potential historic district consisting of buildings, structures, and landscapes dating to the prewar and World War II periods existed at the core of the base. The NAS Alameda Historic District, consisting of 85 contributing buildings built between 1939 and 1945, was found to qualify for listing in the National Register. The Navy and the California Office of Historic Preservation concurred with the findings, and the district was formally listed as eligible for the National Register. The number of contributing buildings was later revised to 87. However, in 2003, one building (Building 101) was lost in a fire, reducing the total number of contributing buildings to 86 (Roma Design Group 2005).

The NAS Alameda Historic District encompasses an area of approximately 350 acres at the center of the former military base. The historic district is bounded by Main Street and Oakland Inner Harbor to the north, 1960s-era multifamily housing to the east, mixed-use industrial buildings and warehouses to the southeast, Seaplane Lagoon to the south, and Nimitz Field to the west (Roma Design Group 2005). Buildings located in AOCs 1, 2, 7, and 10 are included in the NAS Alameda Historic District. This information will be pertinent in the FS for identifying ARARs and assessing the implementability of remedial alternatives considering requirements for protection of the historic structures.

Section 3
PREVIOUS INVESTIGATIONS

The following 27 environmental reports summarize the results of studies conducted within the boundaries of IR Site 35:

- Data Summary Report, RI /FS Phases 2B and 3 (PRC Environmental and Montgomery 1992)
- EBS/Community Environmental Response Facilitation Act Report (ERM-West 1994a)
- Parcel Evaluation Plans (PEPs) (ERM-West 1994b)
- RI/FS Data Transmittal Memorandum for Sites 4, 5, 8, 10A, 12, and 14 (PRC Environmental and Montgomery 1996)
- Data Summary Report, Quarterly Groundwater Monitoring, November 1997–August 1998 (TtEMI and Uribe & Associates 1998)
- Fuel Pipeline Oversight and Sampling Report (TtEMI 2000a)
- EBS Data Evaluation Summary (IT 2001a)
- Field Summary Report for the OU 5 Addendum Activities (Parcels 98, 99, 100, 103, 178, and the North Village Housing Area) (IT 2001b)
- Storm Sewer Study Report, Total Petroleum Hydrocarbon (TPH) Addendum (TtEMI 2001a)
- Summary Report, Data Gap Investigation at CAAs and Other Locations at Alameda Point (TtEMI 2001b)
- Summary of Background Concentrations in Soil and Groundwater, Alameda Point (TtEMI 2001d)
- No Further Action Report, Request for No Further Action, UST 393 (TtEMI 2002a)
- Engineering Evaluation/Cost Analysis (EE/CA) for Water Tower and Antenna Sites, Lead Removal Action (TtEMI 2002b)
- Data Summary Report, Supplemental RI Data Gap Sampling for OU-1 and OU-2 (TtEMI 2002c)
- Supplemental EBS (TtEMI 2002d)
- Underground Fuel Line Abandonment Report (IT 2002)
- Site Closure Report for Parcels 79, 98, 105, 106, and 107 Non-Time-Critical Removal Action (Shaw 2003)
- Field Activity Report, Assessment of PAH Contamination at Selected CERCLA Sites and EBS Parcels (BEI 2004)
- Petroleum ASTs Assessment and Closure Request, Alameda Point (SulTech 2004)
- Project Close-Out Report, CERCLA Time-Critical Removal Action at West Housing Area (Foster Wheeler 2004)

- Removal Action Site Closure Report, Revision 1, Time-Critical Removal Action (TCRA) for Building 195, Pesticide Shed Demolition and Soil Removal (Shaw 2004a)
- Work Plan, Basewide Groundwater Monitoring Program (Shaw 2004b)
- RI Report, Sites 6, 7, 8, and 16, Alameda Point (TtEMI 2004)
- SWMU Evaluation Report for Transfer Parcel EDC-5 (SulTech 2005a)
- FS Report for Operable Unit 1, Sites 6, 7, 8, and 16 (SulTech 2005b)
- PAH Field Activity Study (includes results of the 2002 PAH investigation) (BEI 2005a)
- SI Report for Transfer Parcel EDC-5 (BEI 2005b)

The scopes of the investigations conducted at IR Site 35 are described in the subsections below. Figure 3-1 shows sampling locations from previous investigations within AOCs, within data gap areas, and near SWMUs at IR Site 35. Figure 3-2 shows the PAH areas and previous sampling locations where data for semivolatile organic compounds (including PAHs) were collected. Information from these investigations (including historical uses of each study area as well as analytical results from soil and groundwater sampling) that is pertinent to the specific areas constituting IR Site 35 is summarized in the SAP, Appendix A1. Detailed summaries of investigations and analytical data by EBS Parcel within Transfer Parcel EDC-5 are presented in the SI Report (BEI 2005b).

3.1 PHASES 2B AND 3 INVESTIGATION

In 1991, soil and groundwater samples were collected during an investigation conducted to assess whether contamination exists at IR Site 6, which is surrounded by Transfer Parcel EDC-5 (PRC Environmental and Montgomery 1992) and adjacent to AOCs 19 and 23. During this investigation, a small number of soil samples were also collected outside IR Site 6, but within the boundaries of IR Site 35 and AOC 23.

3.2 ENVIRONMENTAL BASELINE SURVEY

The EBS program was initiated at Alameda Point in 1993 to facilitate property transfer. Initially, the entire property at Alameda Point was divided into 214 EBS parcels. Subsequently, six of these parcels were determined to be located on the property of the Fleet and Industrial Supply Center Alameda Annex, leaving 208 EBS parcels at Alameda Point. A portion of the Todd Shipyards was later added to the Alameda EBS program, resulting in a total of 209 EBS parcels. Subsequent to the completion of the EBS, 53 EBS parcels were divided into subparcels and given alphanumeric identifiers (e.g., a portion of EBS Parcel 61 became EBS Parcel 61A). Some of these subparcels are now included within the boundaries of IR sites, and some are considered buffer zone areas to IR sites (i.e., portions of nonimpacted property that will not be transferred because they are immediately adjacent to impacted property). Figure 3-1 shows the EBS parcels located within the boundaries of Transfer Parcel EDC-5.

The EBS investigation was implemented in two phases. Phase 1 provided an assessment of the environmental impacts due to base operations and included site visits, employee interviews, historical research, and an inventory of all property on a parcel-by-parcel basis (ERM-West 1994a).

Based on the results of the Phase 1 analysis, Phase 2 was conducted to further examine the potential environmental impacts at Alameda Point; this phase included the collection of environmental samples. Phase 2 was conducted in three subphases: 2A, 2B, and 2C (IT 2001a). Activities conducted during these subphases were as follows:

- Phase 2A – collection of soil samples from selected parcels
- Phase 2B – collection of groundwater samples and additional soil samples from selected parcels
- Phase 2C – collection of additional soil and groundwater samples from selected parcels

3.3 PARCEL EVALUATION PLANS

In 1994 and 1995, ERM-West prepared PEPs as supplements to the original EBS (ERM-West 1994b). The PEPs were prepared for each EBS parcel and included EBS findings (e.g., a summary of the historical use of the parcels and results of the EBS inspection) and proposed sampling to address potential contamination.

3.4 FOLLOW-ON REMEDIAL INVESTIGATION SAMPLING

Two follow-on RIs occurred within the boundaries of IR Site 35, one in 1994 (PRC Environmental and Montgomery 1996) and one in 1998 (TtEMI and Uribe & Associates 1998). The purpose of these investigations was to provide additional lithologic, chemical, and hydrogeologic information for selected IR sites at Alameda Point. The goals of the investigations were to characterize the nature and extent of soil and groundwater contamination for the preparation of an RI/FS report. During these investigations, soil and groundwater samples were collected from locations in IR Site 35 adjacent to IR Sites 3, 6, and 21. Analytical results from data gathered during the follow-on investigations are discussed in detail for each study area in Appendix A1.

3.5 BACKGROUND METALS EVALUATION

In 1997, a background evaluation for metals in soil and groundwater was completed at Alameda Point (TtEMI 2001d, SulTech 2005b). Some samples selected for inclusion in the background data sets were collected within the boundaries of IR Site 35.

3.6 FUEL LINE INVESTIGATIONS

Underground pipelines that historically distributed jet propellant grade 5 and other fuels from locations near Seaplane Lagoon to various locations at Alameda Point were removed (34,500 linear feet) or abandoned in place (24,100 linear feet) between June 1998 and February 1999 (TtEMI 2000a). TPH concentrations reported in confirmation

soil and groundwater samples collected following fuel line removal and abandonment were above preliminary remediation criteria screening levels established by the Navy for petroleum-contaminated sites at Alameda Point (DON 2001b). The former fuel line areas were designated Former Fuel Line CAA B (Figure 2-1).

Portions of CAA B are in or adjacent to the following IR Site 35 study areas: AOCs 11, 12, 18, 20, 21, and 23 and EBS Parcels 78, 79, and 205. The dense network of fuel lines in CAA B is in the tarmac area and the branches stretch northward from that area into Transfer Parcel EDC-5.

As part of a fuel line abandonment and removal project conducted for the Navy by International Technology Corporation from October 2001 through April 2002, suspected fuel lines within IR Site 35 boundaries were investigated (IT 2002). Locations of these suspected fuel line segments were in AOC 23 (near EBS Parcels 110, 123, and 124) and along West Tower Avenue bordering AOCs 17 and 19. Geophysical surveys, exploratory potholes, and a review of historical documents (including base utility drawings) did not detect any fuel lines in these areas. The Closure Report (IT 2002) for the fuel line abandonment project concluded that results of investigations strongly suggest these fuel lines do not exist. Furthermore, no further action was recommended for CAA B because it met the criteria for low-risk fuel site closure requirements set forth by the San Francisco Bay RWQCB (TtEMI 2003).

3.7 DATA GAP INVESTIGATIONS

Two separate data gap investigations included the collection of samples in IR Site 35. A corrective action data gap investigation was conducted at Alameda Point in 2000 (TtEMI 2001b), and a series of separate data gap investigations was conducted within the boundaries of OU-1 and OU-2 in 2001 (TtEMI 2002c). Analytical results from data gathered during the data gap investigations are discussed in detail for each study area in Appendix A1.

3.7.1 Corrective Action Data Gap Investigation

This investigation was conducted at Alameda Point in 2000 and included the collection of additional samples at one of the EBS parcels located within the boundaries of IR Site 35 (TtEMI 2001b). Soil samples were collected from one boring in EBS Parcel 125 to investigate the potential presence of petroleum-related contaminants from historical engine-testing activities. Concentrations of petroleum-related compounds reported above detection limits did not exceed screening levels established for the study.

3.7.2 Operable Units 1 and 2 Data Gap Investigation

The OU-1 and OU-2 data gap investigations had three objectives: 1) delineation of contaminant plumes in groundwater, 2) characterization of inorganic constituents in soil and groundwater, and 3) investigation of a storm sewer exposure pathway (TtEMI 2002c). General results of the data gap investigations relating to the first two objectives are summarized in the subsections that follow, and are further discussed in area-specific summaries included in the SAP, Appendix A1.

3.7.2.1 DELINEATION OF CONTAMINANT PLUMES IN GROUNDWATER

To further define volatile organic compound (VOC) and TPH plumes at IR sites in OU-1 and OU-2, groundwater samples were collected from monitoring wells and direct-push borings (TtEMI 2002c). Analytical results indicated the presence of shallow groundwater contamination migrating to Transfer Parcel EDC-5 from two adjacent areas. Contaminated groundwater originating from the IR Site 3 Group (IR Sites 3, 4, 11, and 21) may have impacted groundwater in the southern portion of AOC 23 and in the western potion of AOC 25 with benzene, 1,1-dichloroethane, vinyl chloride, and/or TPH. In addition, contaminated groundwater originating from IR Site 6 may have impacted the eastern portion of AOC 19 and the northeastern corner of AOC 23 with TPH and chlorinated VOCs, primarily cis-1,2-dichloroethene and vinyl chloride.

3.7.2.2 CHARACTERIZATION OF INORGANIC CONTAMINANTS IN SOIL AND GROUNDWATER

A data gap investigation was conducted to further investigate the lateral extent of lead in soil and groundwater in an area identified by the EBS in the northern portion of IR Site 3 (TtEMI 2002c). Analytical results of the data gap samples indicated that lead contamination in soil and groundwater in this area extends into the western portion of AOC 24.

3.8 STORM SEWER INVESTIGATIONS

Storm sewer lines in Transfer Parcel EDC-5 flow to one of four outfalls along Oakland Inner Harbor (Outfalls A, B, D, and E) to the north or to one of four outfalls along Seaplane Lagoon (Outfalls F, FF, G, and H) to the south. Outfall A drains AOC 1; Outfall B drains AOC 2; Outfall D drains AOCs 3 and 9, AST 016, and OWS 017; Outfall E drains AOCs 4, 5, 6, 7, 8, and 10; Outfall F drains AOC 20; Outfall FF drains EBS Parcel 205; Outfall H drains AOCs 15, 16, 24, and 25; and Outfall G drains all the remaining AOCs in IR Site 35. A series of storm-sewer-related investigations was conducted at Transfer Parcel EDC-5, including:

- removal of sediments from storm sewer segments;
- use of closed-circuit television to identify cracks, offset joints, and resulting areas of groundwater infiltration; and
- identification of areas where shallow groundwater contamination had a potential for infiltrating into cracked or offset storm sewer segments.

Storm sewer investigation reports documented the presence of TPH and benzene, toluene, ethylbenzene, and xylenes in shallow groundwater at isolated locations within the boundaries of Transfer Parcel EDC-5. The reports also concluded that the majority of storm sewer segments in this transfer parcel were not acting as a preferential pathway (where contaminated groundwater could enter through compromised storm sewer conduits) (TtEMI 2001a). However, in Transfer Parcel EDC-5, five storm sewer segments between IR Sites 5 (located west of EDC-5) and 6 (located west of AOC 23) were identified as "damaged" and "submerged or likely submerged" in the shallow

groundwater, and were consequently recommended for future repairs due to the presence of known groundwater contamination in their vicinity (TtEMI 2001a). These "low priority lines," susceptible to infiltration by contaminated groundwater, were intersected by groundwater plumes of IR site chemicals of concern at concentrations below screening levels. The screening levels established for these investigations (TtEMI 2001a) consisted of marine ambient water quality criteria (NOAA 1999). The affected segments were Segments 5G-3 to 5G-7 (within AOC 19), 5G-2B to 5G-2A (upstream from AOC 23), 6G-18 to 6G-18-1A (within AOC 17), 10G to 11G, and 11G to 11GA (upstream from AOCs 12 and 23).

In addition, one storm sewer segment in Transfer Parcel EDC-5, near IR Site 7 (south of AOC 15), was recommended for further investigation by data gap sampling (TtEMI 2001a). This line was identified because of the presence of contaminated groundwater and the "unknown" conditions of the storm sewer line itself (TtEMI 2001a). Storm sewer segments were investigated further during the OU-1 and OU-2 data gap activities in 2002 (TtEMI 2002c).

As a follow-up investigation to the 2001 report (TtEMI 2001a), soil samples were collected during the 2002 OU-1 and OU-2 data gap investigation (DGI) sampling activities (TtEMI 2002c) to assess whether storm sewer lines provided preferential pathways for contaminant migration. Storm sewer bedding materials were tested for geotechnical properties to assess whether they were more permeable than surrounding fill and, therefore, might provide preferential pathways for contaminant migration. Results of DGI geotechnical analyses indicated the permeability of the storm drain system bedding material and native fill soils were similar. The data summary report concluded that neither the storm drain bedding materials nor the storm drain lines, including lines within Transfer Parcel EDC-5, were acting as preferential conduits for the transport of contaminants in nearby soil or groundwater (TtEMI 2002c).

To assess whether contaminants were conveyed through the storm sewer lines to surface water through outfalls, sampling of storm sewer manholes, catch basins, and outfalls was conducted at 22 locations distributed among IR Sites 5, 6, 9, 11, 14, 15, 16, 21, and 23 (TtEMI 2002c). Water samples from manholes, catch basins, and outfalls were analyzed for TPH and VOCs. Both TPH and VOCs were reported at concentrations exceeding detection limits, but concentrations did not exceed ecological reference values (ERVs) or maximum contaminant levels. (ERVs were developed in the final Field Sampling Plan and Quality Assurance Project Plan for the OU-1 and OU-2 DGI [TtEMI 2001c]).

Based on the low concentrations of VOCs and TPH reported in storm sewer water samples collected within IR Sites 5, 6, and 7, it is unlikely that infiltration to storm sewers is providing a preferential pathway for significant levels (concentrations above screening levels) of groundwater contamination from plumes at IR Sites 5, 6, and 7 to reach EDC-5 parcels.

3.9 OPERABLE UNIT 5 ADDENDUM SAMPLING

Samples were collected within IR Site 35 as part of the OU-5 Addendum activities conducted in 2001 in support of the OU-5 RI (IT 2001b). Samples of fill material were

collected at AOCs 7 and 14 in IR Site 35 and analyzed for PAHs (see Appendix A1 of the SAP). B(a)P equivalent concentrations were calculated and compared to the Alameda Point-specific residential soil screening criterion of 620 µg/kg (DON 2001a). B(a)P equivalent concentrations exceeded that criterion at several locations, as discussed in detail for each study area in Appendix A1.

3.10 BASEWIDE GROUNDWATER MONITORING PROGRAM

A basewide groundwater monitoring program was implemented in 2002 and is ongoing at Alameda Point (Shaw 2004b). The purpose of the program is to inventory, assess, and evaluate the adequacy of the current monitoring well network, as well as to evaluate groundwater quality at Alameda Point. Four of these monitoring wells are located in Transfer Parcel EDC-5, three of which (13-MW-3, MBG-3, and MO3-11) are located in IR Site 35. Analytical results from data gathered during the basewide groundwater monitoring activities are discussed in detail for each study area in Appendix A1.

3.11 POLYNUCLEAR AROMATIC HYDROCARBON STUDIES AT ALAMEDA POINT

In 2002 and 2003, BEI conducted two separate PAH-related investigations that included the collection of soil samples within the boundaries of IR Site 35. The 2002 PAH study was included as Appendix D of the SI Report for Transfer Parcel EDC-5 (BEI 2005a). Results of the 2003 PAH sampling investigation were included in the Field Activity Report, Assessment of PAH Contamination at Selected CERCLA Sites and EBS Parcels (BEI 2004).

The 2002 PAH study was designed to characterize PAH concentrations in fill soil at transfer parcels with no known releases. Soil samples were collected at four depths from each location (0 to 0.5, 0.5 to 2, 2 to 4, and 4 to 8 feet bgs). Based on findings of the 2002 PAH study (BEI 2005a), soil removals were conducted at IR Site 35, as discussed further in Section 3.14.

A second PAH-specific soil sampling event was conducted at 19 IR sites and 3 EBS parcels at Alameda Point in 2003 (BEI 2004). The purpose of the investigation was to collect sufficient data to identify possible PAH contamination at the IR sites and EBS parcels. For PAHs, B(a)P equivalent concentrations were calculated and compared to the Alameda Point-specific residential soil screening criterion of 620 µg/kg (DON 2001a). Reported concentrations of PAHs in soil samples were above screening criteria at AOCs 2, 4, 6, 7, 13, 14, 15, 16, 17, and 23, as well as some areas within Transfer Parcel EDC-5 that are outside these AOCs. Areas recommended for further evaluation in the SI Report included those areas where a cancer risk above 10^{-5} was associated with PAHs.

Some areas that were not carried forward as AOCs (those areas where a cancer risk associated with PAHs was at or below 10^{-5}) contained individual samples with B(a)P equivalent concentrations above 620 µg/kg. The Navy and regulatory agencies have been discussing how to address the presence of residual PAHs in soil at Alameda Point. This issue and how it relates to Transfer Parcel EDC-5 will be discussed in the RI/FS report.

3.12 LEAD REMOVAL ACTION

Because LBP may have been used historically, the DTSC collected soil samples near two water towers (Structures 033 and 088) in EBS Parcels 106 and 107 (AOC 12) in May 1999. Concentrations of lead exceeding the residential soil preliminary remediation goal (PRG) were reported. Subsequently, in July and August 2001, an investigation was conducted to determine the extent of lead contamination surrounding these two water towers as well as a third water tower (Structure 066), also located in EBS Parcel 107, and two radio antenna towers (Structures 036A and 036B) located in EBS Parcels 79 and 98 (AOC 10), respectively (TtEMI 2002b). The third water tower (Structure 066) and one radio antenna tower (Structure 36B) were not present at the time of the 2001 investigation; only the concrete footings to the former radio antenna tower were observed. Adjacent EBS Parcel 105 was also investigated, since it is unpaved and lead concentrations exceeding the residential soil PRG were reported nearby. Structures 033 and 088 were located in AOC 12, and Structure 036B was located in AOC 10; both areas are within IR Site 35.

An EE/CA was completed in 2002 (TtEMI 2002b). The EE/CA presented a framework for evaluating the best remedial technologies to address LBP on the water tanks and antenna towers and lead-impacted soil near these structures. During the EE/CA, a site-specific human-health removal action objective was developed for lead using the DTSC Lead Risk Assessment Spreadsheet Version 7 model. This removal action objective (199 milligrams per kilogram [mg/kg]) was compared to the reported concentrations of lead; concentrations of lead in 678 samples exceeded the removal action objective.

Based on these results, a non-time-critical removal action for lead was conducted between November 2002 and July 2003, during which time 1,620 cubic yards of soil was removed (Shaw 2003). Lead concentrations in all of the removal action confirmation samples were below the removal action objective of 199 mg/kg. However, results from previous investigation samples collected through hardscape and outside the excavation areas indicated lead concentrations above 199 mg/kg. Analytical results from soil under hardscape are discussed further in the area-specific summaries for AOCs 10 and 12 in the SAP, Appendix A1.

3.13 PESTICIDE REMOVAL ACTION

During the EBS Phase 2A sampling activities, concentrations of pesticides and polychlorinated biphenyls (PCBs) exceeding residential soil PRGs were reported near Building 195 in EBS Parcel 98 (AOC 8). This building had previously been used as a pesticide and fertilizer storage shed where small batches of pesticides and fertilizers were mixed. In addition, concentrations of lead exceeding the residential soil PRG associated with LBP were identified in the surrounding soil at Building 195. Based on the analytical results and the potential for these constituents to pose a threat to human health, a TCRA was conducted (Shaw 2004a). Between February and March 2002, 203 cubic yards of soil was removed (from a maximum depth of 2 feet bgs). The results of confirmation sampling indicated that PCBs and lead were present at concentrations below their respective cleanup levels; pesticides were not reported. As a result, no additional action was recommended in the vicinity of Building 195 in EBS Parcel 98 (Shaw 2004a).

The cleanup levels used during the TCRA were U.S. EPA PRGs for residential soil (U.S. EPA 2002) for pesticides, 1 mg/kg for PCBs, and 209 mg/kg for lead.

3.14 POLYNUCLEAR AROMATIC HYDROCARBON REMOVAL ACTION

PAH concentrations were reported above the Alameda Point-specific residential soil screening criterion (620 µg/kg) in soil samples collected from portions of IR Site 35 during the 2002 PAH study. This prompted the Navy to conduct a TCRA of the top 2 feet of soil in an area referred to as the West Housing Area (Foster Wheeler 2004). Soil removals in the West Housing Area were conducted using a grid pattern at EBS Parcels 62, 96, 97 (AOC 4), 80 (AOC 9), 98 (AOCs 5, 7, and 8), and 103 (AOCs 13, 14, and 18). Locations of PAH removal areas relative to IR Site 35 are shown on Figure 2-1. Analytical results from data gathered during the PAH removal action are discussed in detail for each study area in Appendix A1.

3.15 SITE INSPECTION REPORT, TRANSFER PARCEL EDC-5

A site inspection was conducted at Alameda Point to evaluate current environmental conditions at Transfer Parcel EDC-5 (BEI 2005b). Historical uses of the 74 EBS parcels were evaluated. Where past use indicated the potential for adverse environmental conditions, analytical data and human-health risk were also evaluated to determine whether further evaluation of the parcels should be recommended.

Analytical results were obtained from 19 environmental studies previously conducted for Transfer Parcel EDC-5. In coordination with representatives of U.S. EPA and DTSC, selected analytical data from these studies were compared to the lower of either U.S. EPA PRGs or California-modified PRGs for soil and tap water (U.S. EPA 2004). Concentrations of metals in soil were also compared to background values established for Alameda Point (TtEMI 2001d, SulTech 2005b). Human-health risks were then calculated for the 46 EBS parcels and 18 decision areas for which data were available. Decision areas were developed because a significant portion of the housing at the transfer parcel was located in a single, large EBS parcel. This large parcel (and others, as appropriate) was subdivided to reduce the size of the exposure area, thus assuring that estimates of potential human-health risks were inherently conservative.

To calculate cancer risk, separate target risk levels were assessed for PAHs and non-PAH chemicals in soil. The cumulative target risk level for PAHs in soil was equivalent to 10^{-5}, as established during the PAH technical meeting between the Navy, regulatory agencies, and the City of Alameda in May 2001, at which the Alameda Point site-specific residential soil PAH screening criterion of 620 µg/kg was established (DON 2001a). The cumulative target risk level for non-PAH chemicals in soil and for all chemical classes in groundwater was 10^{-6}. The target risk level for noncancer adverse health effects has a hazard quotient of 1 for individual chemicals of potential concern and a cumulative hazard index of 1 for all chemicals. Levels of lead were evaluated using the California-modified residential PRG for lead in soil and the California-modified action level for lead in groundwater.

Recommendations for further evaluation or no further evaluation for the EBS parcels and decision areas were based on a combined assessment of the historical use of the EBS parcels, the results of the data evaluation, and the results of the human-health risk evaluation. Due to the absence of threatened or endangered species and negligible exposure potential for other special-status species at Transfer Parcel EDC-5, ecological risk was not a factor in determining the recommendations for this transfer parcel, and no further ecological investigation was recommended.

Twenty-five areas recommended for further evaluation were identified as AOCs. Subsequent to issuing the SI Report, the Navy and regulatory agencies refined the list of AOCs currently included within IR Site 35.

3.16 SOLID WASTE MANAGEMENT UNIT REPORT FOR TRANSFER PARCEL EDC-5

A summary of previous assessments and investigations of the SWMUs located in Transfer Parcel EDC-5 (including some located in AOCs within IR Site 35) was prepared by SulTech (2005a) and included as Attachment A of the SI Report (BEI 2005b). This SWMU Report for Transfer Parcel EDC-5 recommended further action under CERCLA for two of the SWMUs (OWS 63B in AOC 1 and OWS 067 in AOC 23) located in IR Site 35. Additional findings of the SWMU Report are discussed in detail for each study area in Appendix A1.

Section 4

PRELIMINARY POTENTIAL ARARs EVALUATION

Section 121(d)(1) of CERCLA (42 *United States Code* [U.S.C.] Section [§] 9621[d]) states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be ARARs. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address conditions at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than the federal ARAR. If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations similar to the circumstances of the proposed response action and are well suited to the conditions of the site (U.S. EPA 1988). In this case, a requirement must be determined to be both relevant and appropriate in order to be considered an ARAR.

An ARARs evaluation is typically provided as a component of an FS report. A preliminary identification of potential federal chemical- and location-specific ARARs is included in this Work Plan to provide guidance in supporting the site characterization and the evaluation of alternatives in the FS report. The results of this preliminary evaluation of potential chemical- and location-specific ARARs presented in this section are based on previous investigations at Alameda Point. Action-specific ARARs will be identified and evaluated in the RI/FS report after remedial alternatives have been developed. As the lead federal agency under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan, the Navy is responsible for identifying federal ARARs. The final determination of federal ARARs will be made when the Navy issues the Record of Decision.

The following sections refer only to federal regulations that may apply to the site as "potential federal ARARs." It should be noted that the general regulation or requirement is cited here; only the section(s) specific to the site conditions (i.e., media and chemicals of concern, facility and waste type, remedial technologies selected) will be considered potential ARARs for evaluation in the RI/FS report. This listing will be refined with additions or deletions, as appropriate, as the RI/FS progresses.

4.1 POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs

Chemical-specific ARARs are generally human-health-based or risk-based numerical values or methodologies applied to site-specific conditions that may be considered during the establishment of cleanup levels. Potential federal chemical-specific ARARs identified for use in the RI for IR Site 35 include the following:

- Resource Conservation and Recovery Act (RCRA) standards for waste characterization in *California Code of Regulations* (Cal. Code Regs.),

title (tit.) 22, §§ 66211.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), 66264.94(a)(1),(a)(3),(c),(d), and (e), and 66262.100

- RCRA treatment standards in Cal. Code Regs, tit. 22 § 66268.1(f), 66268.40, 66268.48, and 66268.49
- CERCLA alternative concentration limits in CERCLA Section 121 (d)(2)(B)(ii) (42 U.S.C. § 9621[d][2][B][ii])
- water quality protection standards in the National Toxics Rule and California Toxics Rule at 40 *Code of Federal Regulations* (C.F.R) § 131.36(b) and 131.38
- Clean Water Act 301(b) best control technology and the best available technology economically achievable
- Toxic Substances Control Act requirements for PCB storage and disposal in 40 C.F.R. § 761.61[a][4](i)(A) and (B) and 761.61(c)(2)
- maximum contaminant level goals and maximum contaminant levels for potential drinking water sources at 40 C.F.R. § 141.50 and 141.51, 141.11–141.13 (excluding 141.11[d][3]), 141.61(a) and (c), and 141.62(b)

4.2 POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs

Location-specific ARARs are regulations that apply because of the site location. Potential federal location-specific ARARs identified for IR Site 35 include the following:

- Historic Sites, Buildings, and Antiquities Act of 1935 (16 U.S.C. §§ 461–467; 40 C.F.R. § 6.301[a])
- National Historic Preservation Act of 1966, as amended (16 U.S.C. §§ 461–467; 40 C.F.R. § 6.301[c])
- Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)
- Coastal Zone Management Act (16 U.S.C. § 1456 [c]; 15 C.F.R. § 930)
- Endangered Species Act of 1976 (16 U.S.C. § 1536[a], [h][1][B]), for potential migratory bird species that are threatened or endangered such as the California brown pelican

Section 5
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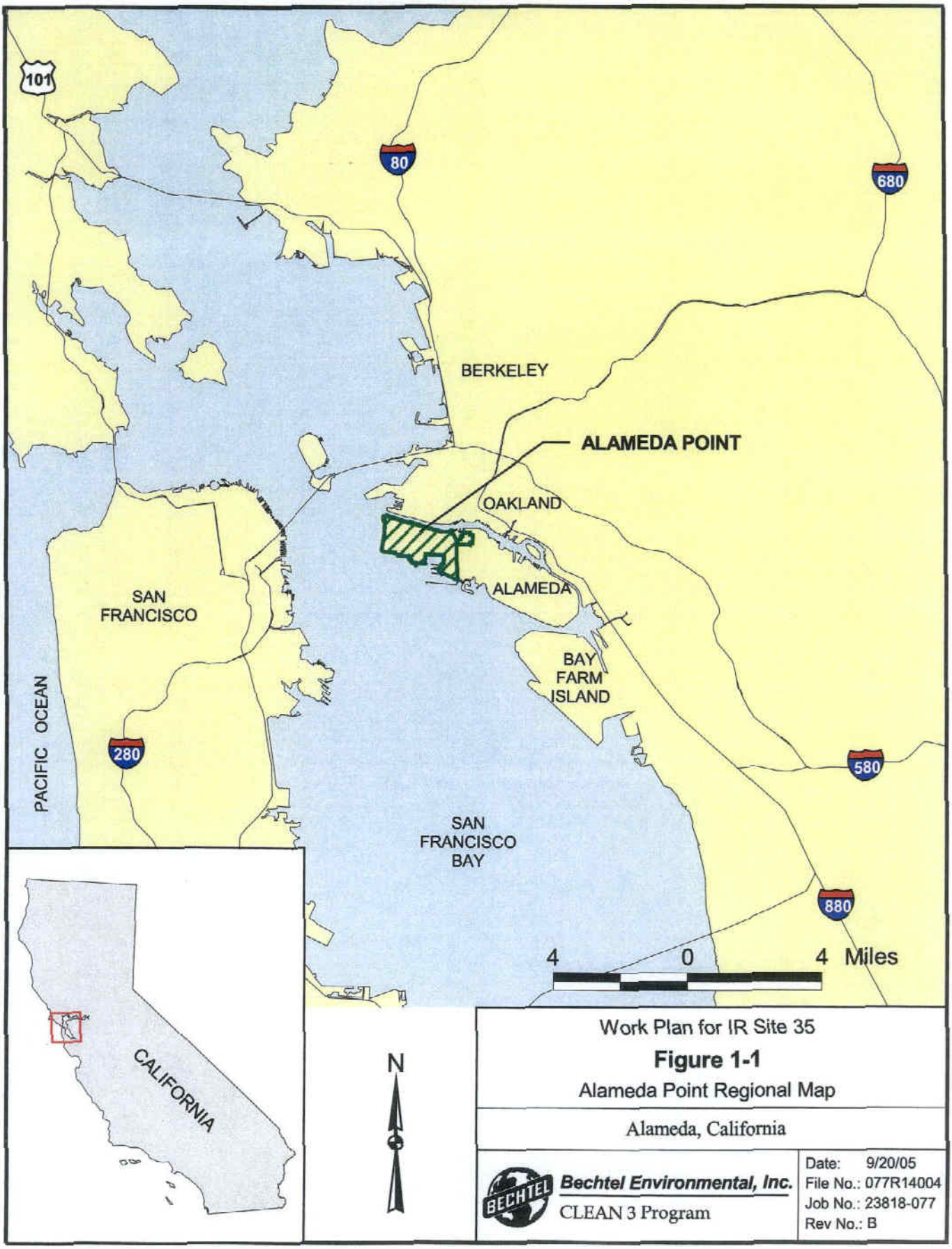
FIGURES

FINAL WORK PLAN
FOR REMEDIAL INVESTIGATION IR SITE 35
AREAS OF CONCERN
IN TRANSFER PARCEL EDC-5

DATED 13 MARCH 2006



Work Plan for IR Site 35

Figure 1-1

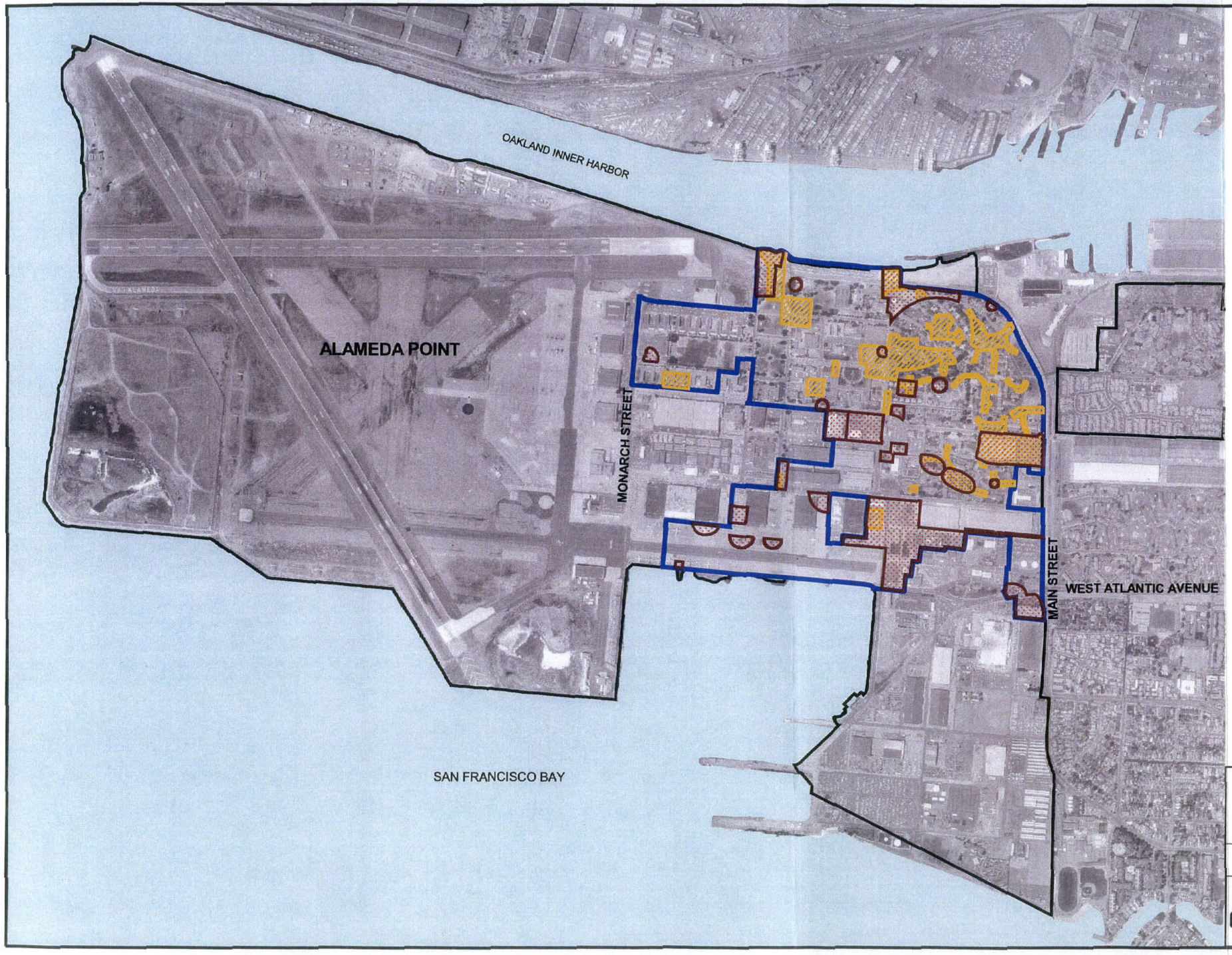
Alameda Point Regional Map

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 9/20/05
File No.: 077R14004
Job No.: 23818-077
Rev No.: B



LEGEND

- IR SITE 35 AOCS AND DATA GAP AREAS
- IR SITE 35 PAH AREAS
- TRANSFER PARCEL EDC-5 BOUNDARY
- NAVY ONSHORE PROPERTY BOUNDARIES
- WATER

NOTES:

EDC – ECONOMIC DEVELOPMENT CONVEYANCE

IR – INSTALLATION RESTORATION (PROGRAM)

N

1200 0 1200 Feet

Work Plan for IR Site 35

Figure 1-2

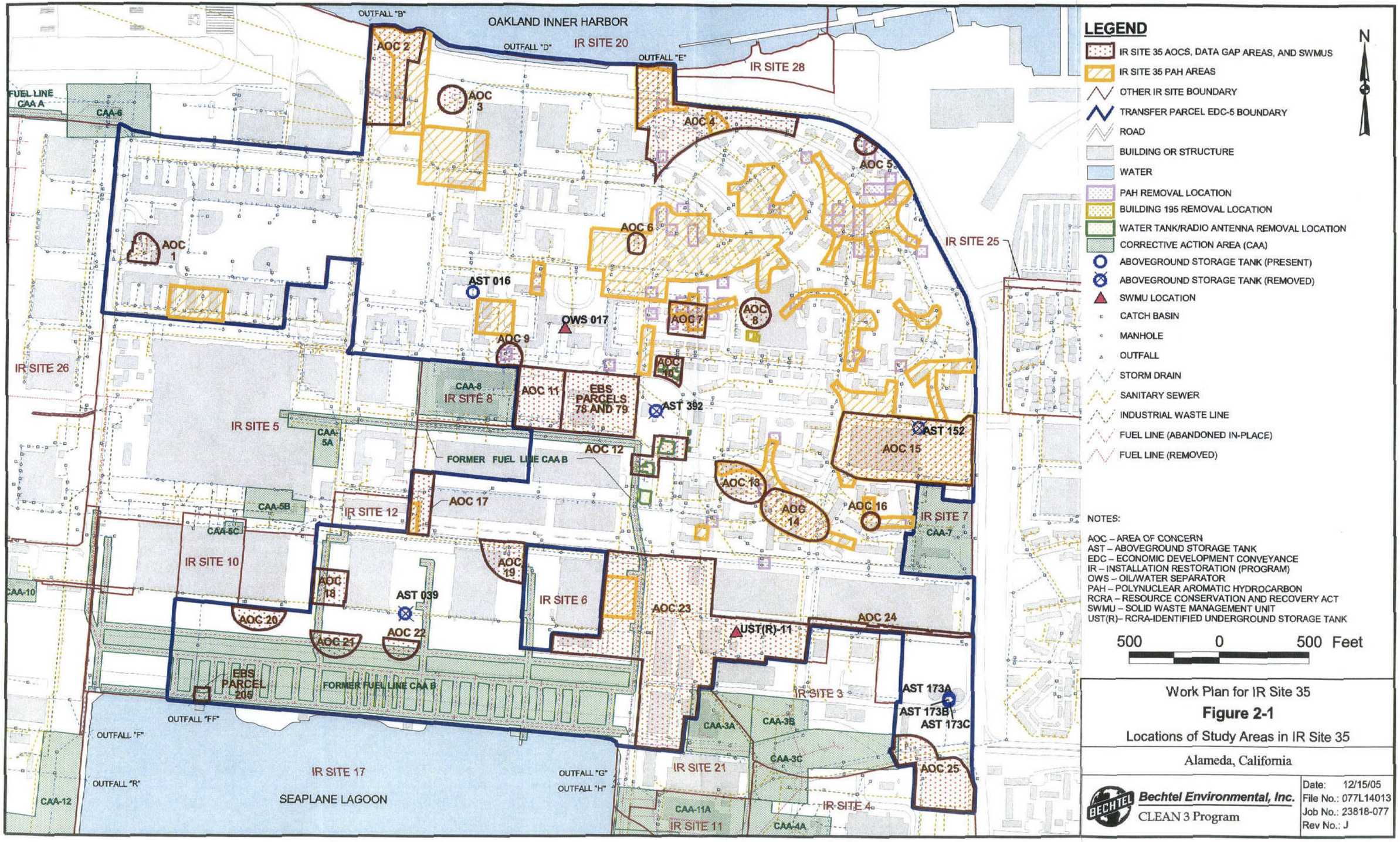
Site Location Map

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 12/16/05
File No.: 077L14006
Job No.: 23818-077
Rev No.: I



LEGEND

- IR SITE 35 AOCS, DATA GAP AREAS, AND SWMUS
- IR SITE 35 PAH AREAS
- OTHER IR SITE BOUNDARY
- TRANSFER PARCEL EDC-5 BOUNDARY
- ROAD
- BUILDING OR STRUCTURE
- WATER
- PAH REMOVAL LOCATION
- BUILDING 195 REMOVAL LOCATION
- WATER TANK/RADIO ANTENNA REMOVAL LOCATION
- CORRECTIVE ACTION AREA (CAA)
- ABOVEGROUND STORAGE TANK (PRESENT)
- ABOVEGROUND STORAGE TANK (REMOVED)
- SWMU LOCATION
- CATCH BASIN
- MANHOLE
- OUTFALL
- STORM DRAIN
- SANITARY SEWER
- INDUSTRIAL WASTE LINE
- FUEL LINE (ABANDONED IN-PLACE)
- FUEL LINE (REMOVED)

N

NOTES:

AOC – AREA OF CONCERN
AST – ABOVEGROUND STORAGE TANK
EDC – ECONOMIC DEVELOPMENT CONVEYANCE
IR – INSTALLATION RESTORATION (PROGRAM)
OWS – OIL/WATER SEPARATOR
PAH – POLYNUCLEAR AROMATIC HYDROCARBON
RCRA – RESOURCE CONSERVATION AND RECOVERY ACT
SWMU – SOLID WASTE MANAGEMENT UNIT
UST(R)– RCRA-IDENTIFIED UNDERGROUND STORAGE TANK

500 0 500 Feet

Work Plan for IR Site 35

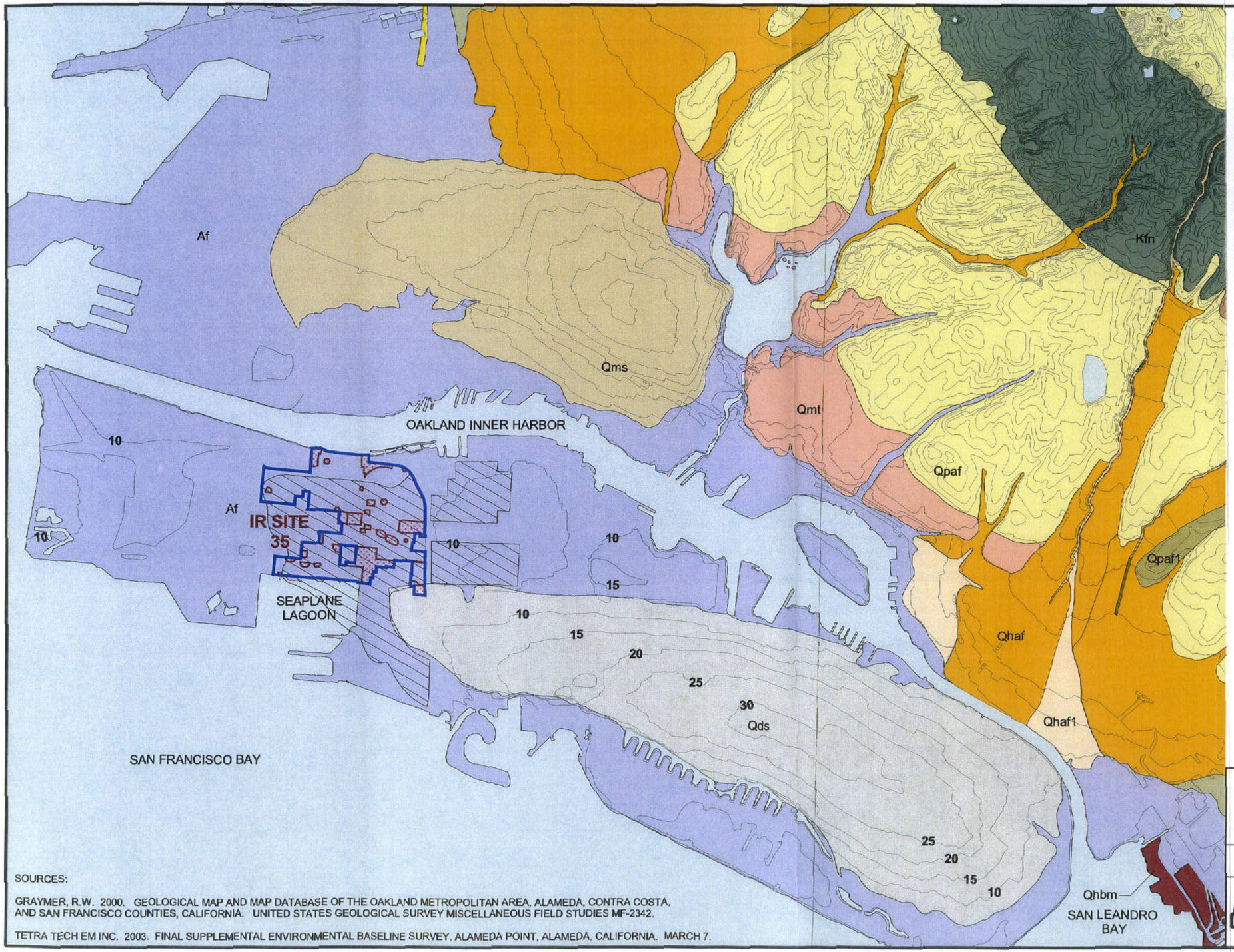
Figure 2-1

Locations of Study Areas in IR Site 35

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/15/05
File No.: 077L14013
Job No.: 23818-077
Rev No.: J



LEGEND

- IR SITE 35 AOCS AND DATA GAP AREAS
- TRANSFER PARCEL EDC-5 BOUNDARY
- 10 TOPOGRAPHIC INTERVAL IN FEET ABOVE MEAN SEA LEVEL
- WATER
- Af - ARTIFICIAL FILL

QUATERNARY (Q) PERIOD:

- Qds - DUNE SAND
- Qhaf - ALLUVIAL FAN AND FLUVIAL DEPOSITS (HOLOCENE)
- Qhaf1 - YOUNGER ALLUVIAL FAN DEPOSITS (HOLOCENE)
- Qhbm - BAY MUD (HOLOCENE)
- Qms - MERRITT SAND (HOLOCENE AND PLEISTOCENE)
- Qpaf - ALLUVIAL FAN AND FLUVIAL DEPOSITS (PLEISTOCENE)
- Qpaf1 - ALLUVIAL TERRACE DEPOSITS (PLEISTOCENE)
- Qmt - MARINE TERRACE DEPOSITS (PLEISTOCENE)

CRETACEOUS (K) PERIOD:

- Kfn - SANDSTONE (LATE CRETACEOUS)
- MARSH CRUST WITHIN FORMER NAVAL AIR STATION ALAMEDA BOUNDARY

NOTES:

EDC – ECONOMIC DEVELOPMENT CONVEYANCE

IR – INSTALLATION RESTORATION (PROGRAM)

N

3000 0 3000 Feet

SOURCES:

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Work Plan for IR Site 35

Figure 2-2

Regional Topography and Geology

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/14/05
File No.: 077R14008
Job No.: 23818-077
Rev No.: G

TOP OF UNIT (IN FEET BELOW GROUND SURFACE)	STRATIGRAPHIC UNITS			HYDROGEOLOGIC UNITS
0	FILL (UNDERLAIN BY MARSH CRUST AT SOME LOCATIONS)			WATER TABLE AQUIFER - NOT A PRIMARY AQUIFER (FWBZ)
5-15	BAY SEDIMENT UNIT (BSU)			AQUITARD
20-50	MERRITT SAND FORMATION			MERRITT SAND AQUIFER - A PRIMARY AQUIFER (SWBZ)
60-80	SAN ANTONIO FORMATION	UPPER UNIT	ALLUVIAL DEPOSITS	
90-120		LOWER UNIT	YERBA BUENA MUD	AQUITARD
			OTHER ESTUARINE DEPOSITS	
100-200	ALAMEDA FORMATION	UPPER CLAY-RICH PORTION		
180-220		ALLUVIAL DEPOSITS		ALAMEDA AQUIFER - PRINCIPAL REGIONAL AQUIFER
400-800	FRANCISCAN FORMATION			

NOTES:

FWBZ – FIRST WATER-BEARING ZONE

SWBZ – SECOND WATER-BEARING ZONE

SOURCE:

TETRA TECH EM, INC. 1999. DRAFT OU-2 RI REPORT, ALAMEDA POINT, ALAMEDA, CALIFORNIA. PREPARED FOR THE UNITED STATES DEPARTMENT OF THE NAVY, ENGINEERING FIELD ACTIVITY WEST, NAVAL FACILITIES ENGINEERING COMMAND, SAN BRUNO, CALIFORNIA. JUNE 29.

Work Plan for IR Site 35

Figure 2-3

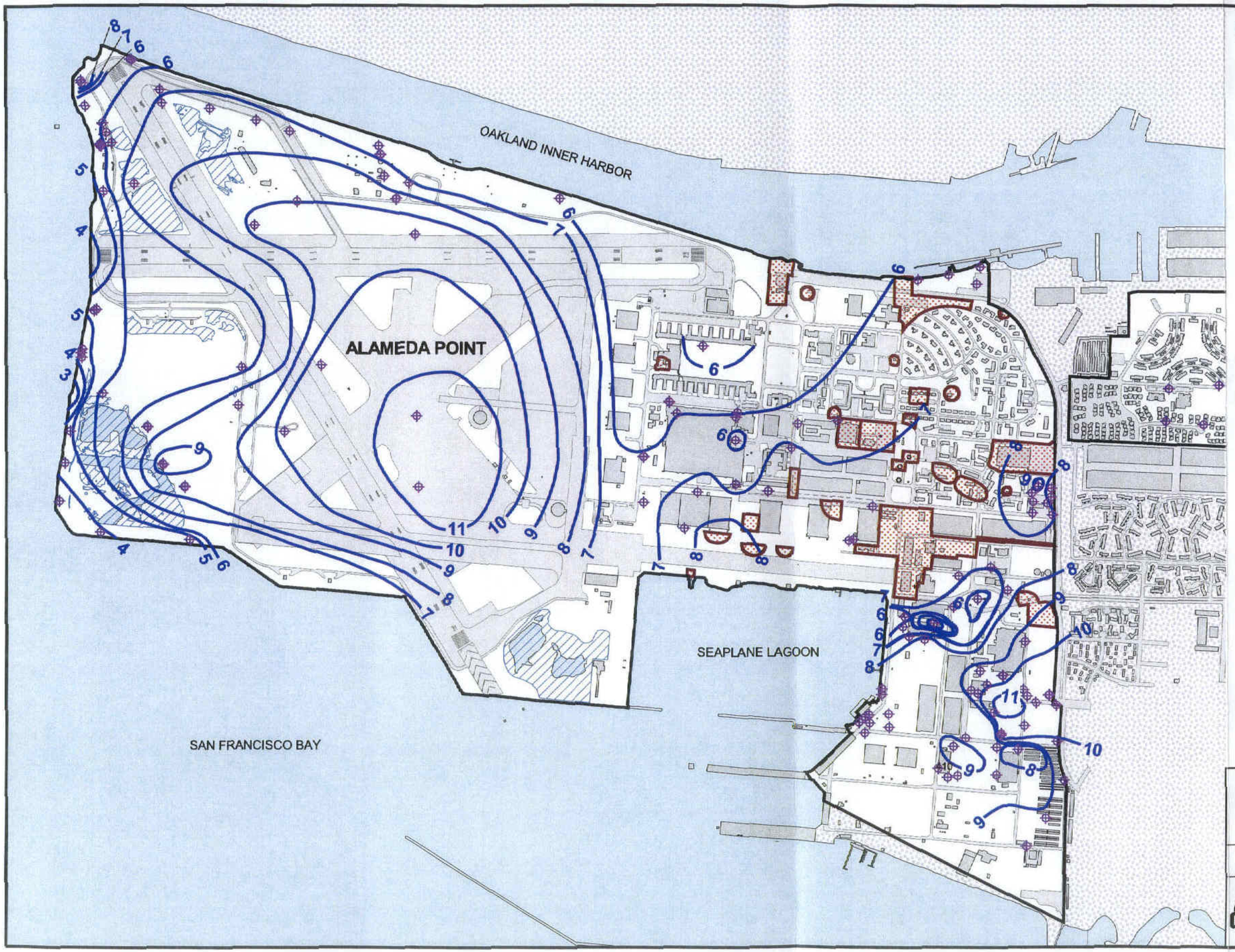
Schematic Geology and Hydrogeology of Alameda Point

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 9/7/05
File No: 077C14109
Job No: 23818-077
Rev No: C



LEGEND

- 7— GROUNDWATER CONTOUR IN FEET ABOVE MEAN SEA LEVEL
- MONITORING WELL LOCATION
- IR SITE 35 AOCS AND DATA GAP AREAS
- BUILDING OR STRUCTURE
- ROAD OR RUNWAY
- WATER
- WETLAND
- NAVY ONSHORE PROPERTY BOUNDARIES
- NON-NAVY PROPERTY

NOTES:

IR – INSTALLATION RESTORATION (PROGRAM)

CONTOURS ARE BASED ON APRIL 1998 GROUNDWATER DATA, WHICH HAVE BEEN CORRECTED FOR TIDAL INFLUENCES

SOURCE :
BASED ON A COMPILATION OF DATA FROM TETRA TECH EM INC. 1999. OU-2 DRAFT REMEDIAL INVESTIGATION REPORT.

N

1200 0 1200 Feet

Work Plan for IR Site 35

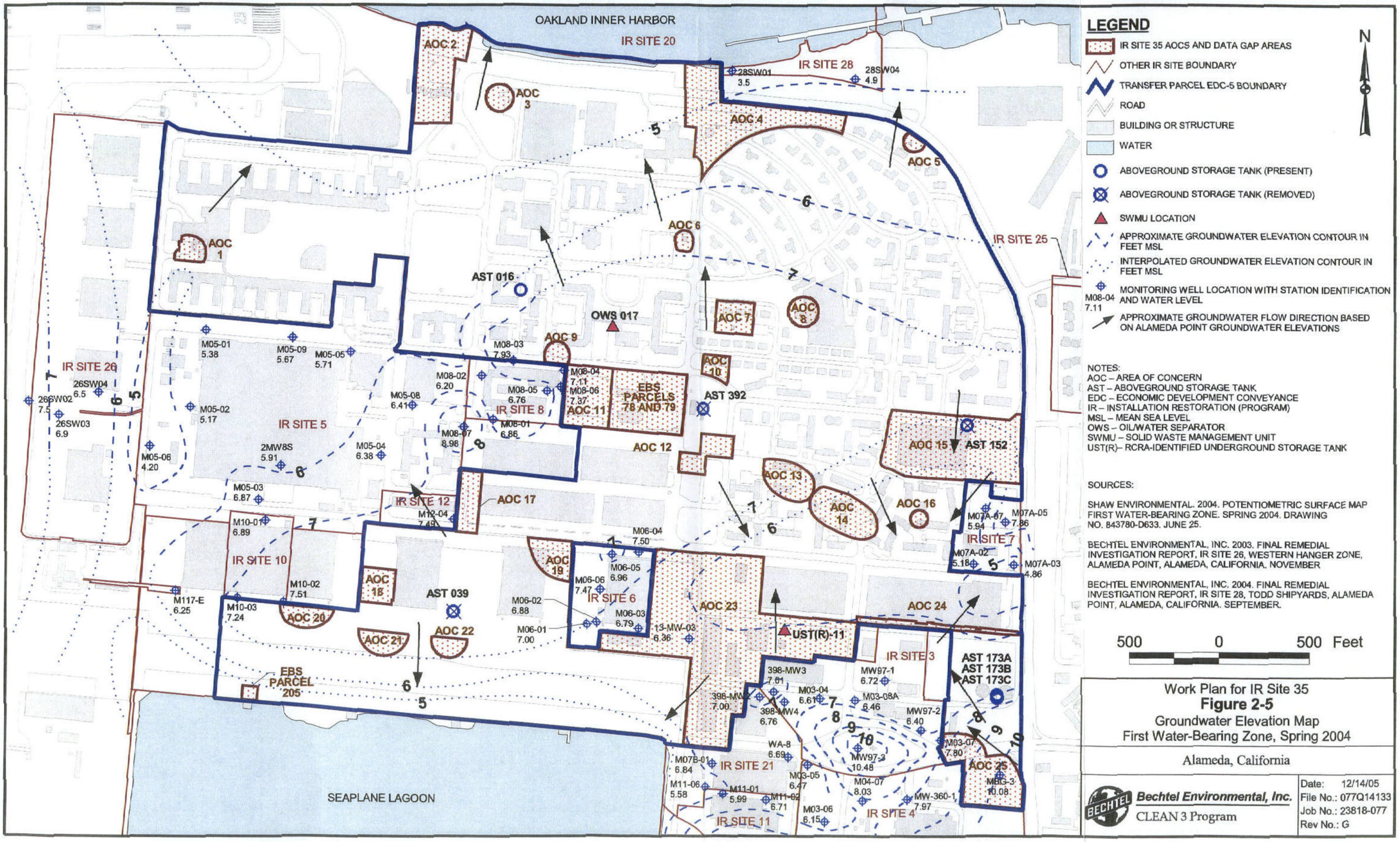
Figure 2-4

Basewide Groundwater Elevation Map
First Water-Bearing Zone

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/14/05
File No.: 077Q14114
Job No.: 23818-077
Rev No.: F



LEGEND

- IR SITE 35 AOCS AND DATA GAP AREAS
- OTHER IR SITE BOUNDARY
- TRANSFER PARCEL EDC-5 BOUNDARY
- ROAD
- BUILDING OR STRUCTURE
- WATER
- ABOVEGROUND STORAGE TANK (PRESENT)
- ABOVEGROUND STORAGE TANK (REMOVED)
- SWMU LOCATION
- APPROXIMATE GROUNDWATER ELEVATION CONTOUR IN FEET MSL
- INTERPOLATED GROUNDWATER ELEVATION CONTOUR IN FEET MSL
- MONITORING WELL LOCATION WITH STATION IDENTIFICATION AND WATER LEVEL (e.g. M08-04 7.11)
- APPROXIMATE GROUNDWATER FLOW DIRECTION BASED ON ALAMEDA POINT GROUNDWATER ELEVATIONS

N

NOTES:
AOC – AREA OF CONCERN
AST – ABOVEGROUND STORAGE TANK
EDC – ECONOMIC DEVELOPMENT CONVEYANCE
IR – INSTALLATION RESTORATION (PROGRAM)
MSL – MEAN SEA LEVEL
OWS – OIL/WATER SEPARATOR
SWMU – SOLID WASTE MANAGEMENT UNIT
UST(R)– RCRA-IDENTIFIED UNDERGROUND STORAGE TANK

SOURCES:

SHAW ENVIRONMENTAL. 2004. POTENTIOMETRIC SURFACE MAP FIRST WATER-BEARING ZONE. SPRING 2004. DRAWING NO. 843780-D633. JUNE 25.

BECHTEL ENVIRONMENTAL, INC. 2003. FINAL REMEDIAL INVESTIGATION REPORT, IR SITE 26, WESTERN HANGER ZONE, ALAMEDA POINT, ALAMEDA, CALIFORNIA. NOVEMBER

BECHTEL ENVIRONMENTAL, INC. 2004. FINAL REMEDIAL INVESTIGATION REPORT, IR SITE 28, TODD SHIPYARDS, ALAMEDA POINT, ALAMEDA, CALIFORNIA. SEPTEMBER.

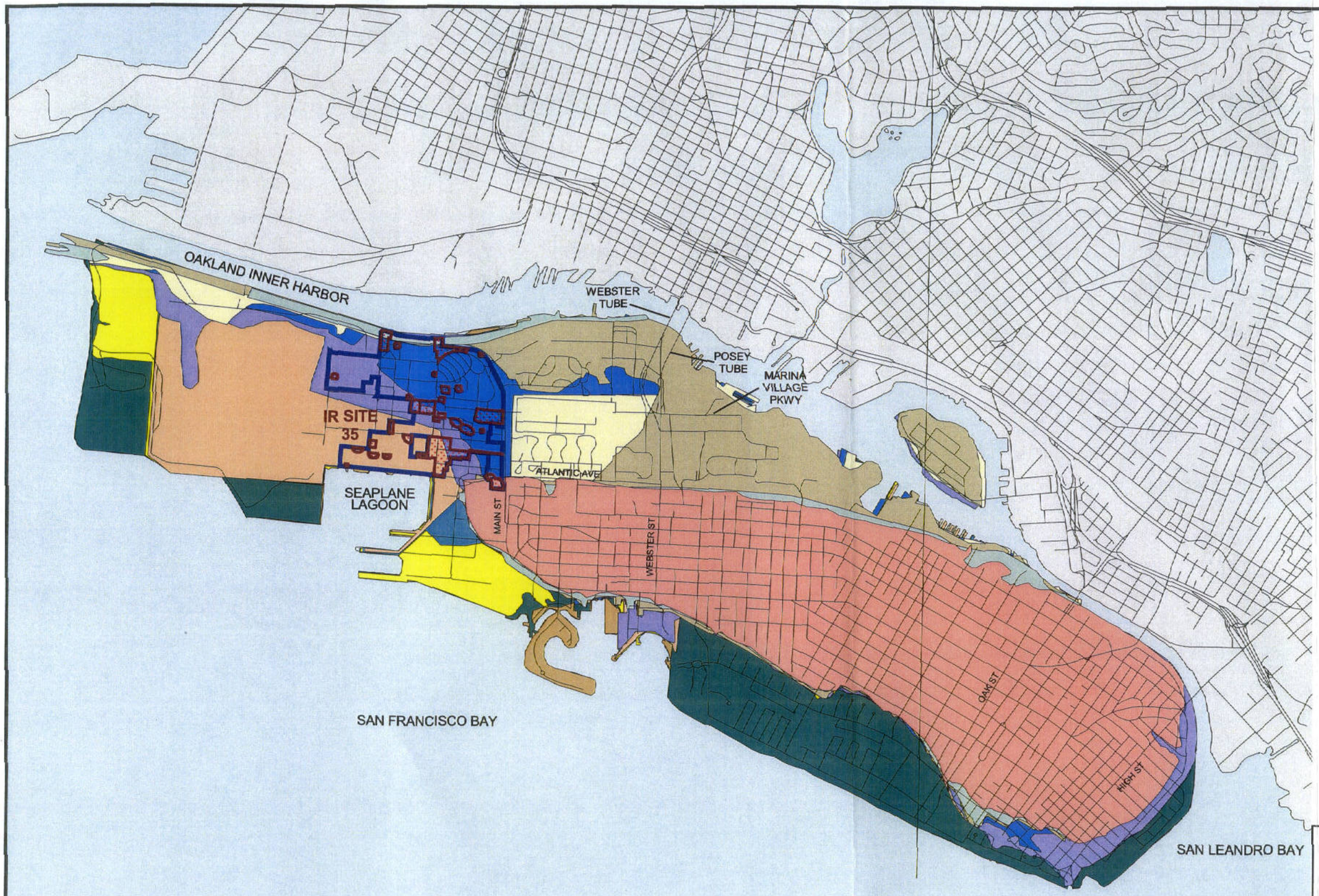
500 0 500 Feet

Work Plan for IR Site 35
Figure 2-5
Groundwater Elevation Map
First Water-Bearing Zone, Spring 2004

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/14/05
File No.: 077Q14133
Job No.: 23818-077
Rev No.: G



LEGEND

- IR SITE 35 AOCS AND DATA GAP AREAS
- TRANSFER PARCEL EDC-5 BOUNDARY
- DRY LAND 1859
- FILL MATERIAL IN PLACE IN 1903
- FILL MATERIAL IN PLACE IN 1919
- FILL MATERIAL IN PLACE IN 1927
- FILL MATERIAL IN PLACE IN 1930
- FILL MATERIAL IN PLACE IN 1936
- FILL MATERIAL IN PLACE IN 1941
- FILL MATERIAL IN PLACE IN 1945
- FILL MATERIAL IN PLACE IN 1949
- FILL MATERIAL IN PLACE IN 1959
- FILL MATERIAL IN PLACE IN 1973
- WATER

NOTES:

EDC – ECONOMIC DEVELOPMENT CONVEYANCE

IR – INSTALLATION RESTORATION (PROGRAM)

N

3000 0 3000 Feet

SOURCES: UNITED STATES COAST GEODETIC SURVEY 1859, 1903, 1919, 1927, 1930, AND 1941; OAKLAND BOARD OF PORT COMMISSIONERS 1936 AND 1945; UNITED STATES GEOLOGICAL SURVEY 1949, 1959 [PHOTO REVISED 1968 AND 1973], 1980a, 1980b, 1980c, AND 1980d.

Work Plan for IR Site 35

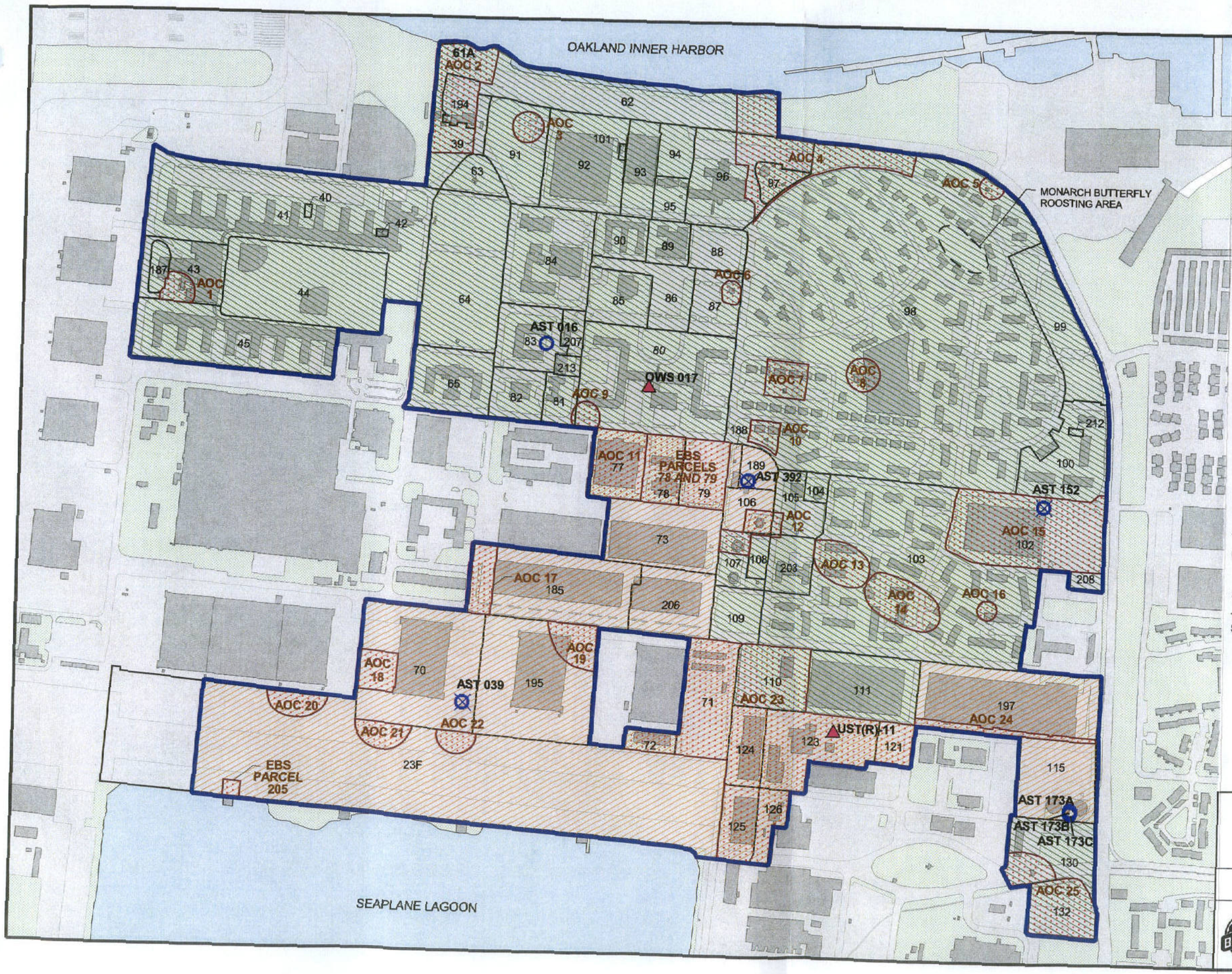
Figure 2-6

History of Artificial Fill at Alameda Island (1859-1973)

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/14/05
File No.: 077L14009
Job No.: 23818-077
Rev No.: G



LEGEND

- IR SITE 35 AOCS, DATA GAP AREAS, AND SWMUS
- TRANSFER PARCEL EDC-5 BOUNDARY
- URBAN HABITAT AREA
- BARREN HABITAT AREA
- 98 EBS PARCEL
- ROAD OR PAVED AREA
- BUILDING OR STRUCTURE
- UNPAVED AREA
- WATER
- ABOVEGROUND STORAGE TANK (PRESENT)
- ABOVEGROUND STORAGE TANK (REMOVED)
- SWMU LOCATION

N

NOTES:

AOC – AREA OF CONCERN

AST – ABOVEGROUND STORAGE TANK

EBS – ENVIRONMENTAL BASELINE SURVEY

EDC – ECONOMIC DEVELOPMENT CONVEYANCE

IR – INSTALLATION RESTORATION (PROGRAM)

OWS – OIL/WATER SEPARATOR

RCRA – RESOURCE CONSERVATION AND RECOVERY ACT

SWMU – SOLID WASTE MANAGEMENT UNIT

UST(R) – RCRA-IDENTIFIED UNDERGROUND STORAGE TANK

SOURCE:

TETRA TECH EM INC. 2003. ALAMEDA POINT ARCVIEW ®QUERY STATION. MAY 20.

500 0 500 Feet

Work Plan for IR Site 35

Figure 2-7

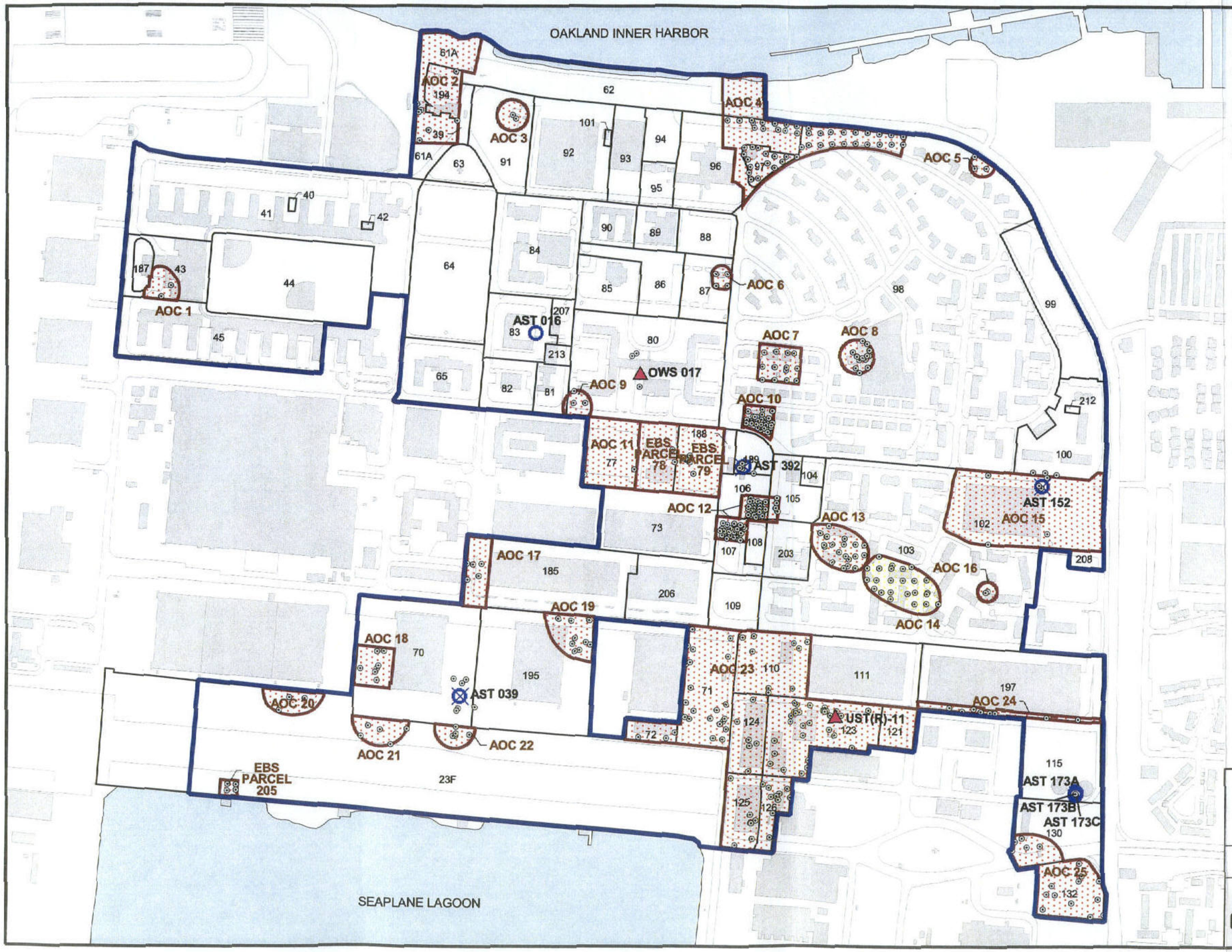
Habitat Areas

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 12/14/05
File No.: 077L14115
Job No.: 23818-077
Rev No.: G



LEGEND

- IR SITE 35 AOCS, DATA GAP AREAS, AND SWMUS
- TRANSFER PARCEL EDC-5 BOUNDARY
- ROAD
- BUILDING OR STRUCTURE
- WATER
- 98 EBS PARCEL
- ABOVEGROUND STORAGE TANK (PRESENT)
- ABOVEGROUND STORAGE TANK (REMOVED)
- SWMU LOCATION
- HISTORICAL SAMPLING LOCATION

NOTES:

AOC – AREA OF CONCERN

AST – ABOVEGROUND STORAGE TANK

EBS – ENVIRONMENTAL BASELINE SURVEY

EDC – ECONOMIC DEVELOPMENT CONVEYANCE

IR – INSTALLATION RESTORATION (PROGRAM)

OWS – OIL/WATER SEPARATOR

RCRA – RESOURCE CONSERVATION AND RECOVERY ACT

SWMU – SOLID WASTE MANAGEMENT UNIT

UST(R) – RCRA-IDENTIFIED UNDERGROUND STORAGE TANK

N

500 0 500 Feet

Work Plan for IR Site 35

Figure 3-1

Previous Sampling Locations in IR Site 35 AOCs, Data Gap Areas, and SWMUs

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 1/05/06
File No.: 077L14012
Job No.: 23818-077
Rev No.: I

OAKLAND INNER HARBOR

SEAPLANE LAGOON

AOC 1
AOC 2
AOC 3
AOC 4
AOC 5
AOC 6
AOC 7
AOC 8
AOC 9
AOC 10
AOC 11
AOC 12
AOC 13
AOC 14
AOC 15
AOC 16
AOC 17
AOC 18
AOC 19
AOC 20
AOC 21
AOC 22
AOC 23
AOC 24
AOC 25

EBS PARCEL 78
EBS PARCEL 79
EBS PARCEL 205

AST 015
AST 392
AST 102
AST 939
AST 173A
AST 173B
AST 173C
UST(R)-11
OWS 017

LEGEND

STATION ID

- GROUNDWATER SVOC SAMPLE LOCATION
- SOIL SVOC SAMPLE LOCATION
- REPORTED SVOC CONCENTRATION EXCEEDS PRIMARY MCL AT THIS LOCATION
- B(a)P EQUIVALENT CONCENTRATION EXCEEDS 620 µg/kg AT THIS LOCATION
- IR SITE 35 AOCS, DATA GAP AREAS, AND SWMUS
- IR SITE 35 PAH AREAS
- TRANSFER PARCEL EDC-5 BOUNDARY
- ROAD
- BUILDING OR STRUCTURE
- WATER
- EBS PARCEL
- ABOVEGROUND STORAGE TANK (PRESENT)
- ABOVEGROUND STORAGE TANK (REMOVED)
- SWMU LOCATION

NOTES:

AOC – AREA OF CONCERN
AST – ABOVEGROUND STORAGE TANK
EBS – ENVIRONMENTAL BASELINE SURVEY
EDC – ECONOMIC DEVELOPMENT CONVEYANCE
IR – INSTALLATION RESTORATION (PROGRAM)
OWS – OIL/WATER SEPARATOR
RCRA – RESOURCE CONSERVATION AND RECOVERY ACT
SWMU – SOLID WASTE MANAGEMENT UNIT
UST(R) – RCRA-IDENTIFIED UNDERGROUND STORAGE TANK

N

250 0 250 Feet

Work Plan for IR Site 35
Figure 3-2
Previous Sampling Locations in PAH Areas
Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 1/25/06
File No.: 077L14275
Job No.: 23818-077
Rev No.: C

TABLES

FINAL WORK PLAN
FOR REMEDIAL INVESTIGATION IR SITE 35
AREAS OF CONCERN
IN TRANSFER PARCEL EDC-5

DATED 13 MARCH 2006

Table 1-1
Summary of Environmental Concerns and Proposed Sampling Program

Study Area	EBS Parcel	Primary Environmental Concerns	Total Number of Sampling Locations	NUMBER OF SAMPLES[a] PER MEDIUM	
				Soil[b]	Groundwater[c]
AOCs					
AOC 1	43	Three OWSs per agencies' request.	3	9	3
AOC 2	61A and 194	PAHs in soil; hazardous materials storage area.	4	12	2
AOC 3	91	Pesticides in soil.	6	15	3[d]
AOC 4	97	PAHs in soil and metals in soil and groundwater.	No sampling; existing analytical results sufficient for risk assessment.		
AOC 5	98	Sewage pump station per agencies' request.	4	12	2
AOC 6	87	PCB-containing oil spill with no confirmation samples collected.	6	12	0
AOC 7	98	PAHs and PCBs in soil.	No sampling; existing analytical results sufficient for risk assessment.		
AOC 8	98	PCBs in soil.	5	10	0
AOC 9	80 and 81	Pesticides in soil and potential releases from grease trap per agencies' request.	4	12	1
AOC 10	98	Lead in soil outside lead removal area.	5	15	0
AOC 11	77	Chemical storage at the parcel, stains observed, and minimal sampling conducted.	4	12	2
AOC 12	105, 106, and 107	Lead in soil outside lead removal area; sediment samples to assess if lead-containing soil entered storm sewer system during removal action.	16	44[e]	0
AOC 13	103	Pesticides in soil.	7	14	0
AOC 14	103	PAHs in soil.	No sampling; existing analytical results sufficient for risk assessment.		
AOC 15	102	PAHs in soil; limited PAH samples collected.	3	9	0
AOC 16	103	PAHs in soil.	No sampling; existing analytical results sufficient for risk assessment.		
AOC 17	185	VOCs, TPH, and metals in soil and groundwater.	3	9	3

Table 1-1 (continued)

Study Area	EBS Parcel	Primary Environmental Concerns	Total Number of Sampling Locations	NUMBER OF SAMPLES[a] PER MEDIUM	
				Soil[b]	Groundwater[c]
AOC 18	70	Hazardous materials storage area with limited sampling.	4	12	2
AOC 19	195	VOCs in groundwater; two OWSs per agencies' request.	OWSs to be removed under IR Site 6 FS; soil excavation and groundwater delineation will be conducted as part of IR Site 6. AOC removed from IR Site 35.		
AOC 20	23F	Two OWSs per agencies' request.	2	6	2
AOC 21	23F	VOCs in groundwater.	2	6	2
AOC 22	23F	SVOCs in groundwater.	No sampling; AOC removed from IR Site 35.		
AOC 23	71, 72, 110, 121, 123, 124, 125, 126	Areawide environmental concern: contamination in groundwater (various chemicals) in the area and the historic use of the parcels for industrial purposes. Additional parcel-specific concerns: VOCs and PAHs in soil at EBS Parcel 71; potential VOCs in groundwater at EBS Parcel 72; industrial waste pump station, extensive chemical storage and staining, and limited sampling at EBS Parcel 110; potential chemical releases at EBS Parcel 121; OWS per agencies' request and PCBs in soil at EBS Parcel 123; potential chemical releases at EBS Parcels 124 and 125; metals in soil and groundwater at EBS Parcel 126.	41	90	40
AOC 24	197	OWS per agencies' request; metals in soil and groundwater in the western portion of AOC 24 will be addressed under IR Site 3.	1	3	1
AOC 25	130 and 132	Metals in groundwater; proximity to IR Site 4 with known metals contamination in groundwater.	4	9	4
AOCs Total			**124**	**311**	**67**

Table 1-1 (continued)

Study Area	EBS Parcel	Primary Environmental Concerns	Total Number of Sampling Locations	NUMBER OF SAMPLES[a] PER MEDIUM	
				Soil[b]	Groundwater[c]
Data Gap Sites					
EBS Parcel 78	78	Data gap per agencies' request.	4	12	4
EBS Parcel 79	79	Data gap per agencies' request.	4	12	4
EBS Parcel 205	205	Assess whether soil and groundwater have been impacted by possible releases from NADEP GAP 73; per agencies' request.	2	6	2
Data Gap Sites Total			**10**	**30**	**10**
SWMUs					
SWMU OWS 017	80	Assess oil trap and metals in groundwater.	1	2	1
SWMU OWS 611[f]	189	NA	0	0	0
SWMU AST 016	83	Assess whether chemicals from ASTs impacted soil and/or groundwater.	1	2	1
SWMU AST 039	70		1	2	1
SWMU AST 152	102		1	2	1
SWMU AST 173A/B/C	115		1	2	1
SWMU AST 392	189		1	2	1
SWMU UST(R)-11[g]	NA	Confirm UST removal results.	0	0	0
SWMUs Total			**6**	**12**	**6**
PAH Areas	NA		0	0	0
TOTALS			**140**	**353**	**83**

Notes:

[a] see Tables 2-1 and 2-2 in the Sampling and Analysis Plan (Attachment A) for analytical methods for proposed soil samples and groundwater samples, respectively; Appendix A1 contains a detailed description of the proposed sampling rationale and design

[b] see Table 1-5 in the Sampling and Analysis Plan for soil sampling depths

[c] groundwater samples will be collected from approximately 5 to 10 feet below the water table to allow for sufficient sample volume

[d] groundwater samples will be extracted and held by the laboratory; they will be analyzed if pesticides are reported in the deepest soil samples

[e] 30 samples include 2 sediment samples from catch basins and/or storm sewer lines

[f] SWMU OWS 611 found not to exist; no sampling proposed

[g] UST(R)-11 addressed under AOC 23

Table 1-1 (continued)

Acronyms/Abbreviations:
AOC – area of concern
AST – aboveground storage tank
EBS – environmental baseline survey
FS – feasibility study
GAP – generator accumulation point
IR – Installation Restoration (Program)
NA – not applicable
NADEP – Naval Aviation Depot
OWS – oil/water separator
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound
SWMU – solid waste management unit
TPH – total petroleum hydrocarbons
UST – underground storage tank
VOC – volatile organic compound

Table 2-1
Monthly Temperature and Rainfall Summary*

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average maximum temperature (°F)	57.3	61.6	63.3	66.5	69.0	71.7	72.6	73.6	74.6	72.0	63.9	57.4	66.9
Average minimum temperature (°F)	44.5	47.9	49.1	50.6	53.5	55.7	57.0	58.3	58.3	55.3	49.6	44.5	52.0
Average total precipitation (inches)	4.85	4.40	3.56	1.35	0.56	0.12	0.07	0.10	0.32	1.31	3.45	3.33	23.4

Source:
* Oakland Museum data from October 1, 1970, to July 31, 2000

Acronym/Abbreviation:
°F – degrees Fahrenheit

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ATTACHMENT A

SAMPLING AND ANALYSIS PLAN
(INCLUDES FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN)

Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL SAMPLING AND ANALYSIS PLAN (INCLUDES FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) FOR REMEDIAL INVESTIGATION AT IR SITE 35 AREAS OF CONCERN IN TRANSFER PARCEL EDC-5 ALAMEDA POINT, ALAMEDA, CALIFORNIA

CTO-0077/0040-1
March 2006

Prepared by:
BECHTEL ENVIRONMENTAL, INC.
1230 Columbia Street, Suite 400
San Diego, California 92101-8502

PROFESSIONAL GEOLOGIST
ERIC A JOHANSEN
No 6643
Exp. 10/31/06
STATE OF CALIFORNIA

Signature: Eric Johansen Date: 3/13/06
Eric Johansen, PG 6643, CTO Leader

Signature: Anil P. Dharmapal Date: 3/13/2006
Anil P. Dharmapal, Quality Manager

Signature: Nars A. Ancog Date: 3/13/2006
Nars A. Ancog, NAVFAC Southwest QA Officer

QUALITY ASSURANCE PROJECT PLAN ELEMENTS

U.S. EPA QAPP* Element and Section Number	This SAP Section
A. Project Management	**1 Project Description and Management**
A1. Title and Approval Sheet	Report Cover
A2. Table of Contents	A-i Table of Contents
A3. Distribution List	Transmittal Letter
A4. Project/Task Organization	1.1 Project/Task Organization
A5. Problem Definition/Background	1.2 Problem Definition/Background
A6. Project/Task Description	1.3 Project/Task Description
A7. Quality Objectives and Criteria	1.4 Quality Objectives and Criteria
A8. Special Training/Certification	1.5 Special Training/Certification
A9. Documents and Records	1.6 Documents and Records
B. Data Generation and Acquisition	**2 Data Generation and Acquisition**
B1. Sampling Process Design (Experimental Design)	2.1 Sampling Process Design
B2. Sampling Methods	2.2 Sampling Methods
B3. Sample Handling and Custody	2.3 Sample Handling and Custody
B4. Analytical Methods	2.4 Analytical Methods
B5. Quality Control	2.5 Quality Control
B6. Instrument/Equipment Testing, Inspection, and Maintenance	2.6 Instrument/Equipment Testing, Inspection, and Maintenance
B7. Instrument/Equipment Calibration and Frequency	2.7 Instrument/Equipment Calibration and Frequency
B8. Inspection/Acceptance of Supplies and Consumables	2.8 Inspection/Acceptance of Supplies and Consumables
B9. Nondirect Measurements	2.9 Nondirect Measurements
B10. Data Management	2.10 Data Management
C. Assessment/Oversight	**3 Assessment and Oversight**
C1. Assessments and Response Actions	3.1 Assessments and Response Actions
C2. Reports to Management	3.2 Reports to Management
D. Data Validation and Usability	**4 Data Validation and Usability**
D1. Data Review, Verification, and Validation	4.1 Data Review, Verification, and Validation
D2. Verification and Validation Methods	4.2 Verification and Validation Methods
D3. Reconciliation With User Requirements	4.3 Reconciliation With User Requirements

Note:
* U.S. EPA 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. March.

Acronyms/Abbreviations:
QAPP – quality assurance project plan
SAP – sampling and analysis plan
U.S. EPA – United States Environmental Protection Agency

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Appendix

ACRONYMS/ABBREVIATIONS

ACPWA	Alameda County Public Works Agency
AOC	area of concern
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	(U.S. EPA) Contract Laboratory Program
COC	chain of custody
CSM	conceptual site model
CTO	contract task order
DQO	data quality objective
DTSC	(California Environmental Protection Agency) Department of Toxic Substances Control
EBS	environmental baseline survey
EDC	economic development conveyance
FS	feasibility study
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHRA	human-health risk assessment
IDW	investigation-derived waste
IR	Installation Restoration (Program)
LCS	laboratory control sample
MS	matrix spike
MSD	matrix spike duplicate
NAVFAC	Naval Facilities Engineering Command
OU	operable unit
OWS	oil/water separator

PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PG	Professional Geologist
PP	program procedure
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
%R	percent recovery
RI	remedial investigation
RPD	relative percent difference
RPM	Remedial Project Manager
RWQCB	(California) Regional Water Quality Control Board
SAP	sampling and analysis plan
SI	site inspection
SIM	selected ion monitoring
SOP	standard operating procedure
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	target analyte list
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
UN	United Nations
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

Section 1
PROJECT DESCRIPTION AND MANAGEMENT

This Sampling and Analysis Plan (SAP) describes the remedial investigation (RI) field activities to be performed at Installation Restoration (IR) Site 35, Areas of Concern (AOCs) in Transfer Parcel Economic Development Conveyance (EDC)-5, Alameda Point (formerly Naval Air Station Alameda), Alameda, California. Figures and tables are presented at the end of this SAP. Appendix A1 to this SAP provides the area-specific description, history, and proposed sampling at each study area in IR Site 35.

Bechtel Environmental, Inc. (BEI), prepared this SAP in accordance with Contract Task Order (CTO)-0077 issued in July 2005 by Base Realignment and Closure Program Management Office West under the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program, Contract No. N68711-95-D-7526.

1.1 PROJECT/TASK ORGANIZATION

The project team for the RI consists of representatives from the Navy and regulatory agencies along with the BEI CLEAN Program team. The names, roles, and contact information for the Navy and CLEAN Program team are presented in Table 1-1, and the organization and relationships of the Navy and CLEAN team members are illustrated on Figure 1-1. The principal decision makers for the RI are the Navy and regulatory agency partners.

1.2 PROBLEM DEFINITION/BACKGROUND

An RI will be conducted for those areas designated as IR Site 35 within Transfer Parcel EDC-5 that have been identified by the Navy and regulatory agencies as requiring further evaluation before early property transfer can occur.

To facilitate early property transfer of Transfer Parcel EDC-5, the RI/feasibility study (FS) process for IR Site 35 is being performed on an accelerated schedule. To meet the accelerated schedule, the Navy and regulatory agencies held four RI/FS planning meetings from May through July 2005. The Navy also had a telephone conference call with United States Environmental Protection Agency (U.S. EPA) on November 14 and with California Environmental Protection Agency Department of Toxic Substances Control (DTSC) on November 17 and 21 (San Francisco Bay Regional Water Quality Control Board [RWQCB] participated in the beginning of the call on November 21) to discuss comments on the draft version of this Work Plan (DON 2005b). Based on discussions in these meetings and telephone calls, agreement on the overall approach was reached, including:

- areas where additional samples will be collected,
- number of borings and types of samples (soil and/or discrete groundwater) at each area,
- numbers and depths of soil samples to be collected per boring, and
- types of analyses that will be performed on samples from each location.

Areas requiring further evaluation, including 25 AOCs, were initially identified in the final Site Inspection (SI) Report for Transfer Parcel EDC-5 (BEI 2005). Subsequent to issuing the SI Report, the list of these areas was refined by the Navy and regulatory agencies. Polynuclear aromatic hydrocarbon (PAH) areas were also added to IR Site 35 in response to comments from U.S. EPA and DTSC on the draft Work Plan. It was agreed that the following areas would be evaluated under IR Site 35:

- 23 of the 25 AOCs identified in the SI Report
  - 2 AOCs (AOCs 19 and 22) were removed from IR Site 35 and included with adjacent IR Site 6 and Corrective Action Area B, respectively
  - 19 AOCs (AOCs 1, 2, 3, 5, 6, 8 through 13, 15, 17, 18, 20, 21, 23, 24, and 25) require additional sampling and analysis
  - 4 AOCs (AOCs 4, 7, 14, and 16) have sufficient data to perform baseline human-health risk analyses
- 3 data gap areas
  - Environmental Baseline Survey (EBS) Parcel 78
  - EBS Parcel 79
  - EBS Parcel 205
- 9 solid waste management units (SWMUs)
  - 1 oil/water separator (OWS) (OWS 017); OWS 611 was also identified as a SWMU; however, the SWMU Report (SulTech 2005) found that this OWS does not exist, and the Navy requested that it be removed from the SWMU list
  - 7 aboveground storage tanks (ASTs) (ASTs 016, 039, 152, 173A, 173B, 173C, and 392)
  - 1 underground storage tank (UST) (UST[R]-11, also known as Tank 393)
- PAH areas
  - PAH areas identified for inclusion in the FS address residual benzo(a)pyrene equivalent concentrations that are above the Alameda Point screening criterion of 620 micrograms per kilogram but do not drive risk above 10^{-5}. No additional samples are proposed in the PAH areas that are outside of AOCs. Also, as agreed upon with U.S. EPA on November 14, 2005, baseline risks will not be calculated for the PAH areas.

In response to regulatory agency requests, borings were added to those proposed in the draft Work Plan, and samples targeting specific features (e.g., an AST or OWS) will be located as close to the feature as possible. Additionally, groundwater elevation data collected as part of the ongoing basewide groundwater monitoring program will be reviewed as part of the RI.

DTSC also identified lead-based paint, chlordane, and sanitary and industrial waste sewer lines as outstanding issues, and requested a comparison of detection limits from previous sampling results with RI comparison criteria. The Navy has policies for addressing the first two issues and will follow these policies. The last issue, along with the comparison of detection limits with RI criteria, will be addressed during the RI, and results will be presented in the RI report. The Navy and agencies will assess whether additional samples will be needed to resolve these issues and determine the best timing to collect data, considering the transfer schedule.

The Navy is aware that contaminated groundwater from adjacent IR sites may have impacted areas within IR Site 35. The Navy will address this groundwater contamination as part of the existing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program IR sites including IR Sites 3, 4, and 21 (Operable Unit [OU]-2B); IR Site 5 (OU-2C); IR Sites 6, 7, and 8 (OU-1); and IR Sites 26 and 28 (OU-6).

In a letter to the DTSC and San Francisco Bay RWQCB dated July 26, 2005, the Navy requested that the seven above-mentioned ASTs be removed from the list of SWMUs evaluated in Transfer Parcel EDC-5 because they were known to contain only petroleum hydrocarbons, and would therefore meet the CERCLA's petroleum exclusion criteria. DTSC responded in a letter dated August 29, 2005, and acknowledged that this issue falls under the jurisdiction of the San Francisco Bay RWQCB.

The time frame for resolution and outcome of the Navy's request is not known. Therefore, the Work Plan includes collection and analysis of soil and discrete groundwater samples to assess possible impact from these petroleum product ASTs.

The boundaries of some areas of IR Site 35 shown on Figure 1-2 may need to be revised based on RI/FS results. Also, some AOCs that were identified solely because of the presence of PAHs may be incorporated into the PAH areas.

1.2.1 Purpose and Objectives

The purpose of the RI is to characterize the nature and extent of contamination in soil and groundwater at IR Site 35 in order to assess risk to human health from the contamination. Analytical results will also provide a basis on which to evaluate types of response actions to be considered in an FS and to support the property transfer process.

The purpose of this SAP is to present systematic planning efforts, implementation guidelines, and review procedures necessary to develop defensible, validated data that will successfully address the objectives of the RI.

1.2.2 Facility Location

Alameda Point is located on the western end of Alameda Island, which lies on the eastern margin of the San Francisco Bay near the City of Oakland, California. Alameda Point is rectangular in shape, approximately 2 miles long from east to west and 1 mile wide from north to south, and occupies approximately 1,734 acres. IR Site 35 is located in the

northeastern portion of Alameda Point. Figure 1-2 shows the location of Alameda Point on Alameda Island, and Figure 1-3 shows the location of IR Site 35.

1.2.3 Site Description and History

Locations of IR Site 35 study areas and SWMUs are shown on Figure 1-4. Descriptions and site histories are detailed for each area in Appendix A1 to this SAP.

1.3 PROJECT/TASK DESCRIPTION

To achieve the objectives identified in Section 1.2.1, the scope of the RI includes the collection and analysis of soil and groundwater samples and the performance of area-specific human-health risk assessments (HHRAs). As discussed in Section 2.9 of the Work Plan, no ecological assessment of terrestrial receptors will be performed due to the lack of suitable habitat and the absence of threatened, endangered, or special-status species at IR Site 35. Groundwater results for study areas adjacent to or near surface water (i.e., AOCs 2, 3, 4, 20, 21, and the southern portion of 23; and EBS Parcel 205) will be compared to criteria for aquatic receptors.

Soil and discrete groundwater samples will be collected from a total of 137 sampling locations at 19 AOCs, 3 RI data gap areas, and 9 SWMUs. In addition, one groundwater sample will be collected from an existing monitoring well, and two sediment samples will be collected from storm sewer catch basins and/or storm sewer lines. All samples collected will be submitted for laboratory analysis.

The proposed sampling locations for each area in IR Site 35 are shown on Figure 1-6 and in Appendix A1. Data will be evaluated to interpret the nature and extent of contamination at IR Site 35. HHRAs will be performed to evaluate the potential risk to human health. U.S. EPA agreed in a November 14, 2005, conference call that baseline risks would not need to be calculated for the PAH areas. To facilitate the accelerated project schedule, results of the RI will be presented in a combined RI/FS report.

1.3.1 Project Planning

The following general tasks will be completed before fieldwork is begun.

1.3.1.1 SUBCONTRACTED SERVICES

The CLEAN Program team will procure subcontractors for geophysical investigation, land surveying, direct-push drilling/sampling, laboratory analysis, independent data validation, and investigation-derived waste (IDW) disposal activities.

1.3.1.2 FIELD EQUIPMENT AND LOGBOOKS

Nonconsumable field equipment will be rented or leased prior to initiating fieldwork. Containers and coolers for sample shipment will be obtained from the subcontract laboratory providing analytical services. Field logbooks and labels (sample, shipping, and IDW) will be prepared in advance by CLEAN Program personnel.

1.3.1.3 NOTIFICATIONS TO PROGRAM PARTICIPANTS

At least 1 week before fieldwork begins, requests for facility access and fieldwork initiation will be transmitted to the Navy Remedial Project Manager (RPM) and Resident Officer in Charge of Construction, and to the Department of Defense Base Realignment and Closure Program Management Office Environmental Compliance Manager. The requests will identify the planned field activities and their estimated duration and the areas where the activities will be conducted. Any access requirements will be facilitated by the Navy.

1.3.2 Project Schedule

As agreed by the regulatory agencies in telephone conference calls held on November 14 and 17, 2005, sample collection was initiated on November 29, 2005, before the Work Plan was finalized (DON 2005). The draft RI/FS report is scheduled for submittal to the regulatory agencies in July 2006.

1.4 QUALITY OBJECTIVES AND CRITERIA

The elements employed in the systematic planning of the project are the conceptual site model (CSM) and the seven-step data quality objective (DQO) process.

A CSM defines site-specific fate and transport processes; sources, mechanisms, and pathways responsible for transporting contaminants; and potential receptors of contaminants. As shown in the CSM for IR Site 35 (Figure 1-5), human-health risk will be evaluated for residential receptors only. While land use for this area (identified in the reuse plans for the central portion of Alameda Point) (LSA 2001) may include commercial, industrial, and recreational as well as residential use, baseline risks will be evaluated for residential receptors only. Residential risks tend to be higher than risks for other receptors, such as commercial/industrial workers, due to higher levels of exposure. Therefore, assessing the risks to residential receptors would be considered protective of other receptors as well. The CSM on Figure 1-5 shows that groundwater exposure pathways will not apply to AOCs where no groundwater samples are collected. Therefore, for these AOCs, the ingestion of groundwater, dermal contact while showering, inhalation of vapors while showering, and migration of vapors from groundwater to indoor air will not be included in risk assessment calculations.

DQOs were prepared in accordance with the U.S. EPA DQO process (U.S. EPA 2000b).

Investigation issues for IR Site 35 have been divided into three groups, based on similarity of sampling rationale and design:

- AOCs (except AOCs that only address OWSs) and data gaps areas
- OWSs
- ASTs/UST

Three sets of DQOs were developed as sitewide approaches for these investigation issues (Tables 1-2, 1-3, and 1-4, respectively). The DQO sets apply to individual areas at IR Site 35 as follows:

- **DQOs for AOCs (except AOCs that only address OWSs; specifically AOCs 1, 20, and 24) and data gap areas** (Table 1-2) apply to the following:
  - AOCs 2 through 18, 21, 23, and 25
  - EBS Parcels 78, 79, and 205
- **DQOs for OWSs** (Table 1-3) apply to the following:
  - OWS 063A, B, C (located in AOC 1)
  - OWS 12A, B (located in AOC 20)
  - OWS 067 (located in AOC 23)
  - OWS 118 (located in AOC 24)
  - OWS 017 (identified as a SWMU outside of the AOCs)
- **DQOs for ASTs and one UST** (Table 1-4) apply to the following:
  - UST(R)-11 (located in AOC 23)
  - ASTs 016, 039, 152, 173A, 173B, 173C, and 392 (identified as SWMUs outside the AOCs)

Data collected during the RI will be used to characterize the nature and extent of contamination at IR Site 35, conduct HHRAs, and support an FS. The Navy recognizes that the extent of contamination may not be fully defined in some areas. However, if there are sufficient data available to assess the nature and magnitude of contamination, then risk assessment and an FS will be performed. Consistent with U.S. EPA's guidance for conducting RIs and FSs under CERCLA (U.S. EPA 1988), the Navy intends "to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for a given site." However, if data are not sufficient to support the risk assessment and FS, the Navy will decide whether it is more efficient to collect additional data as part of IR Site 35 or to "carve out" an area and address it on a parallel track. The Navy and agencies will determine the best timing to collect data considering the transfer schedule (e.g., further delineation may be included as a component of a removal action or remedial alternative in the FS).

Area-specific problem statements and proposed sampling designs to accomplish these objectives are presented in Appendix A1 to this SAP. Proposed sampling locations and analyses are based on general agreements on the overall RI sampling approach reached by the Navy and regulatory agencies during the meetings and telephone calls held in 2005, as described in Section 1.2.

Data used to support an FS will include analytical results for total dissolved solids (TDS) in groundwater samples to help assess whether groundwater beneath IR Site 35 is a potential drinking water source. Discrete (grab) groundwater samples are not optimal for

measuring possible natural attenuation indicator parameters for volatile organic compounds (VOCs) in groundwater. Therefore, available groundwater well data collected during investigations at adjacent IR sites will be reviewed to assess possible natural attenuation.

A summary of samples and analyses proposed for each area is presented in Table 1-5. Proposed sampling locations are shown on Figure 1-6.

1.5 SPECIAL TRAINING/CERTIFICATION

All CLEAN Program personnel who work at a known or potentially hazardous waste site are required to meet the safety and health training requirements of Title 29 *Code of Federal Regulations* Part 1910.120(e). Depending on individual responsibilities in the field and the complexity of a particular project, on-site personnel may be required to meet other special training requirements.

Navy CLEAN personnel typically have undergraduate degrees in environmental science, geology, or engineering. All field personnel are required to undergo 24 hours of in-field supervised training. Additionally, all CLEAN Program field personnel will have completed the initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and will have maintained their training by successfully completing the 8-hour refresher training course within the previous 12-month period. CLEAN Program field personnel will be trained in cardiopulmonary resuscitation and will have first aid qualifications and certifications. At least one site safety and health representative with current 24-hour Occupational Safety and Health Administration safety training will be part of the field team. A minimum of one member of the field team will have at least 30 days of actual field experience on CLEAN field projects. Copies of field clearance records for CLEAN Program personnel will be maintained in the project files. These records will include certificates for initial safety and health training, first aid, cardiopulmonary resuscitation, 8-hour HAZWOPER refresher training, and annual medical clearance.

Subcontractors who work on-site will certify that their employees have been trained for work on hazardous waste project sites and that they have met all applicable medical clearance requirements. This training will meet the same requirements as those for CLEAN Program personnel. Before beginning work at the project site, subcontractors will submit certifications of training for each employee involved in fieldwork to the CLEAN Program Safety and Health Manager. These certifications will be included in the project files. Subcontractors will also assure that these employees attend a safety briefing prior to site entry.

1.6 DOCUMENTS AND RECORDS

Generators of data will follow this SAP and program procedures (PPs) to assure that collected data adhere to CLEAN Program environmental data standards. Relevant standard operating procedures (SOPs) are listed in Section 2.2.1.

1.6.1 Field Documentation

Field activities and original data generated in the field will be recorded using permanently bound, uniquely labeled field logbooks with sequentially numbered pages. At a minimum, the following information will be recorded:

- CTO number
- dates and times of field activities
- names and affiliations of all on-site personnel or visitors
- weather conditions during field activities
- summaries of daily activities and significant events
- records of all samples collected
- references to other field books or electronic data files that contain specific, relevant information
- discussions of problems encountered and their resolutions
- discussions of deviations from the SAP or other governing documents
- descriptions of all photographs taken

1.6.2 Data Packages

Project data will consist of various types, including field measurements and laboratory analyses. Figure 2-1 in the Data Management Plan (Attachment B to the Work Plan) shows the typical data life cycle, including stages of sampling plan development, data collection, data analysis, data review, and data use.

1.6.3 Data Package Format

Data will be tracked and documented through the Program Document Control Center to comply with analytical data reporting requirements as specified in CLEAN Technical Specification-002 (BNI 2004a).

Managing sample information will include the use of data collection forms, chain-of-custody (COC) forms, sample labels, and custody seals, as necessary to follow the procedures outlined in PP T 2.2, Sample Information Management System (BNI 2004b).

Detailed procedures for transmittal of data are provided in PP T 2.2; PP A 1.1, Document Control Records Keeping and Handling; Naval Facilities Engineering Command (NAVFAC) Southwest Environmental Work Instruction No. 6 (NAVFAC Southwest 2005); and various SOPs covering inquiry, collection, and recording of specific data types (BNI 2004b).

Section 2
DATA GENERATION AND ACQUISITION

This section outlines data acquisition and management intended to fulfill the DQOs for the RI. Data acquisition and management include the sampling process design, field sampling methods and procedures, sample handling and custody, laboratory analytical methods, quality control (QC) procedures, instrument quality and calibration maintenance, and data management.

2.1 SAMPLING PROCESS DESIGN

RI activities to be performed under this SAP include utility and land surveys, and soil and discrete groundwater sampling using direct-push drilling.

2.1.1 Utility Survey

Underground utility clearance will be completed before subsurface investigation activities are begun. The entire area within a 5-foot radius of each proposed subsurface sampling location will be cleared using the following protocol.

- Notify Underground Service Alert and schedule a meeting with all interested parties who may potentially be affected by drilling activities.
- Review available Navy, Alameda Point, and City of Alameda utility maps.
- Mark the proposed sampling locations and the utility lines in the immediate vicinity using paint.
- Use geophysical methods (e.g., electromagnetic induction, magnetometry, and ground-penetrating radar) to clear proposed sampling locations of potential subsurface obstructions prior to drilling.

Geophysical results will be analyzed before fieldwork commences to confirm sampling locations. In addition, overhead utility lines and other obstructions will be checked before fieldwork begins.

After pavement is sawed or cored (if paved areas are present), a hand auger will be manually advanced 4 to 5 feet below ground surface (bgs) at each proposed sampling location to check for subsurface obstructions. Because some of the soil samples will be collected at depths shallower than 4 to 5 feet bgs, a direct-push boring will be advanced adjacent to the hand-auger-cleared borehole. A CLEAN Program representative will be on-site to monitor utility clearance data collection and interpretation.

2.1.2 Land Survey

A Registered Land Surveyor will survey borehole locations for position and elevation relative to mean sea level. The measurements will be accurate to plus or minus 0.01 foot vertically and plus or minus 0.1 foot horizontally. All measurements will be referenced to the State Plane Coordinate System, North American Datum 1983, and the North American Vertical Datum 1988.

2.1.3 Soil Sampling

A direct-push method will be used for soil sampling during the RI field investigation. As detailed in Table 1-5, soil samples will be collected at various intervals between ground surface and 8 feet bgs (depending on area-specific investigation objectives). A soil sample will be collected at some locations in the 4-to-8-foot depth interval immediately above the groundwater interface; if groundwater is shallower than 4 feet bgs, then a saturated soil sample will be collected. The estimated depth to groundwater will be noted on the boring log. Proposed soil sampling locations are shown on Figure 1-6 and in Appendix A1. Specific sampling depths at each location are summarized in Appendix A1. Boring permit applications will be submitted to the Alameda County Public Works Agency (ACPWA) at least 2 weeks before the beginning of direct-push drilling activities. Any required field inspection will be coordinated with the ACPWA.

The direct-push method involves the use of a truck-mounted hydraulic/percussion drive point. If necessary, pavement will be cored or sawed to allow access to the soil surface. If the concrete is unusually thick or difficult to core, a field decision will be made to move the boring to a more accessible location. This occurrence will be noted in the field logbook, and the new soil sampling location will be surveyed following sampling. Additionally, the new location will be checked for underground utilities if it has not already been cleared. Data from a borehole that has been relocated in the field will have a note added to that effect in the comments section of the electronic database.

The ground surface will be cleared of visible asphalt, concrete, or gravel subbase prior to soil sampling. After the pavement is cored or sawed (where paved areas are present), a hand auger will be manually advanced to 4 to 5 feet bgs to lessen the risk of impacting underground utilities that may not have been evident by geophysical detection methods. The direct-push boring will be advanced adjacent to the hand-auger-cleared borehole. The hydraulic/percussion drive point will then be advanced downward through the soil. A retractable piston inside the split-barrel sampler prevents soil from filling the liners until the desired sampling interval is reached. The direct-push rods will be advanced to the desired interval where a soil sample will be collected using a split-barrel sampler lined with a stainless steel, brass, or acetate liners. Sampler liners from the sampling depths designated for laboratory analysis will be removed and the ends will be covered with Teflon sheets, capped with plastic end caps, and labeled.

Soil samples for VOC analysis will be collected using an EnCore or equivalent sampling device in accordance with U.S. EPA Method 5035A. This method involves manually pushing an airtight sampling tube that holds approximately 5 grams of soil into the soil sample. The tube is retracted when full of soil and capped with a locking cap to prevent the loss of volatiles during shipping and handling. For sampling locations that will be submitted for VOC analysis only, additional sample volume (e.g., one sampling tube) will be submitted to the laboratory to allow calibration of laboratory instruments for moisture content.

Depending on site conditions and access issues, soil samples at some locations (e.g., AOC 8) may be collected using a hand auger. In these instances, a clean stainless-steel hand auger will be advanced to the appropriate depth, and soil samples collected from the hand auger will be handled as described above for direct-push samples.

Soil samples will be placed in a cooler with ice for transport to a laboratory following COC protocol. Remaining samples will be used to log the soil in accordance with the Unified Soil Classification System and SOP 3, Borehole Logging (BNI 2004b). Detailed subsurface soil sampling procedures are included in SOP 4, Soil Sampling (BNI 2004b).

To provide input for nature-and-extent characterization, HHRA calculations, and FS decision making, direct-push soil samples will be analyzed using the laboratory methods listed below. Specific chemical analyses planned for samples collected from proposed soil sampling locations (Table 1-5) are summarized as follows:

- VOCs, using U.S. EPA Methods 5035A and 8260B
- purgeable-range total petroleum hydrocarbons (TPH) (as gasoline), using U.S. EPA Method 8015-M
- extractable-range TPH (fuel fingerprint), using U.S. EPA Method 8015B-M with silica gel cleanup
- semivolatile organic compounds (SVOCs) (non-PAHs), using U.S. EPA Method 8270C
- PAHs, using U.S. EPA Method 8270C with selected ion monitoring (SIM)
- pesticides, using U.S. EPA Method 8081A
- polychlorinated biphenyls (PCBs), using U.S. EPA Method 8082
- target analyte list (TAL) metals, using U.S. EPA Method 6010B/7000 Series

The direct-push method using a split-barrel sampler lined with stainless steel, brass, or acetate liners will also be used to collect 14 soil samples from seven locations in the vadose zone for analysis of geotechnical parameters. Proposed locations for the collection of geotechnical soil samples are indicated in Table 1-5. These samples will be analyzed for the following soil properties as input for risk assessment calculations, and to support fate-and-transport assessment and FS decision making:

- air permeability, using American Petroleum Institute Recommended Practice 40
- density and moisture, using American Society for Testing and Materials (ASTM) D2937 and D2216
- effective porosity, using the State Water Resources Control Board method
- grain-size distribution, using ASTM C136-96 and D422-63
- liquid limits, using ASTM D4318-00
- hydraulic conductivity, using ASTM D5084-90
- total organic carbon, using the Walkley-Black method

The boreholes will be backfilled completely with an approved sealing material (i.e., neat cement, bentonite, or bentonite-cement mixture) as outlined in SOP 13, Destruction of Boreholes and Wells (BNI 2004b), and in accordance with California Department of Water Resources Bulletin 74-90 (DWR 1990).

The direct-push boring method was selected for field sampling for the following reasons.

- A relatively small quantity of waste soil is generated during boring advancement and sampling.
- Wells will not be constructed at direct-push locations; therefore, larger-diameter boreholes are not required.
- The method is fast and reliable to the expected maximum sampling depth and with the expected soil type.

2.1.4 Sediment Sampling

Grab samples of sediment will be collected from catch basins or storm sewer manholes using clean stainless-steel hand augers. Sediment samples will be collected in accordance with SOP 19, Shallow Freshwater Sediment Sampling (BNI 2004b), and will be placed into laboratory-supplied, wide-mouth, 8-ounce glass jars and analyzed for lead as described in Section 2.1.3. Sediment samples will not be collected for geotechnical testing.

2.1.5 Discrete Groundwater Sampling

Discrete groundwater sampling will be performed using a truck-mounted hydraulic/ percussion drive-point rig. Discrete groundwater samples will be collected within the first water-bearing zone from approximately 5 to 10 feet below the groundwater table to allow for sufficient sample volume. Proposed discrete groundwater sampling locations are shown on the area-specific figures in Appendix A1. Most of the discrete groundwater samples will be collected from the same borings as the soil samples. Specific proposed sampling depths at each location are summarized in Appendix A1.

The hydraulic/percussion drive point will be pushed downward to the desired sampling depth, and then the HydroPunch (or equivalent sampling device) will be retracted to allow groundwater to flow through the screen and into the sampling tip. The HydroPunch has a sacrificial drive point that will be left in place as the screen assembly is pulled to the surface. If an adequate amount of groundwater cannot be collected by the HydroPunch (or equivalent) method, the sampling rods will be removed from the ground, and a 1-inch-diameter polyvinyl chloride (PVC) temporary well casing with 0.010-inch slotted well screen will be inserted into the boring.

Discrete groundwater samples for VOC analysis will be collected using a microbladder pump and new disposable, flexible tubing that runs from the desired sampling depth to the ground surface. The microbladder pump will be used inside either the HydroPunch sampling tool or the 1-inch-diameter PVC temporary well casing for sample collection.

Samples will be collected directly into precleaned laboratory-supplied sample containers at a low flow rate to minimize volatilization of potential analytes (i.e., at a pumping rate to achieve laminar water flow). If turbidity in the temporary well results in the microbladder pump's filter screen becoming clogged repeatedly with silt or other particles, a peristaltic pump will be used to collect the sample. If a peristaltic pump is used, every effort will be made to minimize agitation of the sample. If sample collection times longer than 15 minutes are encountered when using a microbladder pump to collect discrete groundwater samples and fill sample containers for non-VOC analysis, a peristaltic pump may be used.

To provide input for nature-and-extent characterization, HHRA calculations, and FS decision making, discrete groundwater samples will be analyzed for analytes listed below. Specific chemical analyses at each proposed discrete groundwater sampling location (Table 1-5) are summarized as follows:

- VOCs, using U.S. EPA Methods 5035A and 8260B
- TPH-gasoline, using U.S. EPA Method 8015-M
- TPH-fuel fingerprint, using U.S. EPA Method 8015B-M with silica gel cleanup
- SVOCs (non-PAHs), using U.S. EPA Method 8270C
- PAHs, using U.S. EPA Method 8270C SIM
- pesticides, using U.S. EPA Method 8081A
- PCBs, using U.S. EPA Method 8082
- TAL metals, using U.S. EPA Method 6010B/7000 Series
- mercury, using U.S. EPA Method 1631 (low-level detection limits for groundwater samples collected within 500 feet of the shoreline)
- hexavalent chromium, using U.S. EPA Method 1631 (AOC 17 only)
- TDS, using U.S. EPA Method 160.1

Groundwater samples for metals analyses will be filtered in the field prior to shipment to the laboratory. TDS samples will be collected at most locations (Table 1-5) if sufficient groundwater volume can be obtained from the borehole.

2.1.6 Groundwater Monitoring Well Sampling

Groundwater samples will be collected from one existing well (398-MW1) located in EBS Parcel 126, AOC 23. Prior to sampling, the well will be inspected for damage and evidence of tampering and gauged for depth to groundwater and total depth. Depth to groundwater will be measured using an electronic water-level meter in accordance with SOP 7, Water and Free Product Level Measurement in Wells (BNI 2004b).

In accordance with guidelines in SOP 8, Groundwater Sampling (BNI 2004b), the monitoring well will be purged and sampled using a low-flow bladder pump. The discharge tubing used to convey water from the pump outlet to the discharge point at

ground surface will be new, clean, polyethylene tubing. In preparation for purging, the pump and associated electrical wiring will be thoroughly decontaminated. The pump will then be lowered into the well, and the purge rate will be maintained at or below the recharge capability of the formation. During purging, field monitoring parameters (pH, water temperature or electrical conductivity, and turbidity) will be measured and recorded. Measurement of the field monitoring parameters will continue until pH readings are within 0.5 of the two previously recorded values and measurements of temperature and electrical conductivity have stabilized within 10 percent of the two previously measured values for each parameter. Purging will be considered complete when the field parameters have stabilized and a minimum of three well volumes of groundwater have been removed. When these conditions have been met, the required samples will be collected.

Samples will be collected directly into precleaned, laboratory-supplied sample containers at a low flow rate to minimize volatilization of potential analytes (i.e., at a pumping rate to achieve laminar water flow).

Groundwater samples will be collected for the laboratory analyses described in Section 2.1.5.

2.2 SAMPLING METHODS

This section specifies SOPs to be used and describes the methods and procedures to be followed during field activities. The use of these procedures is intended to assure that field measurements are consistent and reproducible.

2.2.1 Standard Operating Procedures

The following SOPs (BNI 2004b) are applicable to the SI activities described in this SAP:

- SOP 2, Drilling Method Evaluation
- SOP 3, Borehole Logging
- SOP 4, Soil Sampling
- SOP 6, Instrument Calibration and Use
- SOP 7, Water and Free Product Level Measurement in Wells
- SOP 8, Groundwater Sampling
- SOP 9, Sample Containers, Preservation, and Handling
- SOP 10, Sample Custody, Transfer, and Shipment
- SOP 11, Decontamination of Equipment
- SOP 13, Destruction of Boreholes and Wells
- SOP 16, gINT System: Borehole and Well Log Data Entry
- SOP 17, Logbook Protocols

- SOP 19, Shallow Freshwater Sediment Sampling
- SOP 22, Investigation-Derived Waste Management
- SOP 33, Activity Hazard Analysis

The CLEAN Program Quality Manager has provided controlled copies of all CLEAN Program SOPs to the Navy, DTSC, San Francisco Bay RWQCB, and U.S. EPA Region 9. Copies of the SOPs can be made available to other document reviewers upon request through the Navy RPM. Field personnel are required to acknowledge receipt of SOPs, and copies of all applicable SOPs will be available on-site. Technical staff members are required to review procedures prior to fieldwork.

2.2.2 Equipment Decontamination

Sampling equipment will be decontaminated between samples in accordance with SOP 11 (BNI 2004b), as follows.

- Large equipment will be decontaminated using a steam- or pressure-washer capable of delivering water at a minimum temperature of 180 degrees Fahrenheit.
- Smaller equipment will be decontaminated as follows.
  - Equipment will be washed in low- or nonphosphate detergent (e.g., Alconox or Liqui-Nox solutions made as directed by the manufacturer).
  - Equipment will be rinsed with potable water.
  - Equipment will be rinsed twice with deionized or distilled water.

Equipment that will not be used immediately following decontamination will be wrapped in new plastic bags. Disposable sampling equipment (e.g., unused portions of acetate sleeves) will be placed with used personal protective equipment (PPE) for disposal.

2.2.3 Investigation-Derived Waste Management

All IDW materials will be managed and disposed by CLEAN personnel according to contract requirements and methods described in SOP 22 (BNI 2004b) and the IDW Management Plan (Attachment C to the Work Plan).

The following types of IDW are expected from field activities:

- decontamination washwater
- purgewater from groundwater well sampling
- soil cuttings
- used PPE and disposable sampling equipment
- nonhazardous solid waste (refuse)

Liquid IDW (decontamination water and purgewater) and soil cuttings will be stored separately in United Nations (UN)-approved 55-gallon drums. Contaminated PPE and sampling equipment will be placed in covered UN 55-gallon drums. Uncontaminated PPE will be placed in industrial waste bins. Regular trash and nonhazardous construction debris will not be mixed with potentially contaminated IDW.

Each container will be clearly marked to indicate the waste source. Before disposal or shipment off-site, containers will be labeled with appropriate United States Department of Transportation identification and classification information by the waste disposal subcontractor.

All IDW will be treated and/or disposed within 90 days of collection. The Navy will be responsible for selecting the methods/location of IDW disposal and for signing all manifests.

2.3 SAMPLE HANDLING AND CUSTODY

Sample custody and documentation are important elements of acceptable and defensible data. Each sample or field measurement must be properly documented to facilitate timely, correct, and complete analysis and to support use of field and laboratory data. The documentation system provides the means to identify, track, and monitor each sample from the point of collection through final data reporting.

2.3.1 Sample Containers

Sample containers will be selected in accordance with U.S. EPA SW-846, Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (U.S. EPA 2005) and with SOP 9 (BNI 2004b).

Soil samples will be collected in new, clean EnCore or similar sampling devices; or stainless steel, brass, or acetate liners as listed in Table 2-1. Sediment samples will be placed in laboratory-supplied glass jars. The approved laboratory will provide the EnCore or similar sampling devices; the drilling subcontractor will provide soil sample liners. Sample containers will be inspected for cleanliness prior to use and will be rejected if found unacceptable.

Groundwater samples will be collected in containers as listed in Table 2-2. The type of container will be determined by the analyte, required preservative, and amount of sample required for the analytical method. Sample containers for groundwater will be provided by the approved laboratory. Sample containers will be inspected for cleanliness prior to use and will be rejected if found unacceptable.

2.3.2 Sample Labeling

Sample labels will be attached to each sample container. The labels will be made of waterproof paper or plastic with gummed backs and will be completed with indelible ink. All corrections will be made by drawing a single line through the error, initialing it, and entering the correct information. Sample labels will clearly indicate the company name,

project name and number, sampling location identifier, ten-character sample number, container identification number, sampling date and time (using 24-hour notation), analysis to be performed, sample preservation method, and the field sampler's name and initials (not preprinted) as described in this SAP and in SOPs 9 and 10 (BNI 2004b).

2.3.3 Sample Preservation

Samples will be preserved in accordance with U.S. EPA SW-846, Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (U.S. EPA 2005) and with SOP 9 (BNI 2004b). Field samples and associated QC samples requiring cooling will be maintained at approximately 4 degrees Celsius until shipment to the laboratory. Tables 2-1 and 2-2 list the required preservation methods for the proposed soil and discrete groundwater samples, respectively. The approved laboratory will add chemical preservatives, as required, to the containers before they are shipped to the field.

2.3.4 Sample Packaging and Shipment

Samples to be shipped to the selected project laboratories will be accompanied by appropriate sample transfer and shipment paperwork, as described in SOP 10 (BNI 2004b). COC forms and custody seals will be used to document possession of samples and to prevent tampering with the samples during shipment to the laboratory. Field investigation crews will prepare all samples for shipment by common carrier to the laboratory per the procedures specified in applicable SOPs. Samples will be packaged properly and dispatched to the designated laboratory (or laboratories) for analysis. The method of shipment, carrier name, and other pertinent information will be entered on the COC forms. Additional sample splits for the Navy or agency archiving will be collected with sample containers provided by others.

Field teams will package the samples for shipment as follows.

1. Attach a sample label to each sample container; cover sample label with clear tape.
2. Place custody seals on the sample container.
3. Wrap all glass containers in foam sheeting or bubble wrap and place them in zip-lock bags.
4. Line coolers with two garbage bags to prevent leakage during shipment. Place wet ice and zip-lock-bagged samples inside inner garbage bag. Secure each garbage bag individually by closing with tie wraps or other closures.
5. Place the completed COC forms in a plastic zip-lock bag and tape it to the inside of the cooler lid.
6. Secure the cooler with custody seals and cover the seals with clean plastic tape to prevent accidental breaks.

At the end of each day, the field crew will ship the samples to the laboratory by common carrier in accordance with SOP 10 (BNI 2004b).

2.3.5 Sample Documentation

This section describes the use of paperwork, including field logbooks, photographs, COC records, sample labels, and custody seals, following procedures presented in SOPs 10 and 17.

2.3.5.1 FIELD LOGBOOKS AND RECORDS

All field activities will be documented in controlled, permanently bound and prepaginated field logbooks. Field logbooks will be used to record details such as those listed in Section 1.6.1, Field Documentation. Field measurements may include depth to groundwater and sampling location distance from the nearest fixed object.

All entries will be legible and written in indelible ink. Corrections will consist of line-out deletions that will be initialed and dated by the person making the correction. The remaining space on each page will be crossed out. Completed field logbooks will be delivered to the BEI CLEAN Program Document Control Center in San Diego. Other forms used to record field safety- and health-related data will be maintained in project files and folders. Detailed logbook procedures are described in SOP 17 (BNI 2004b).

2.3.5.2 PHOTOGRAPHS

Photographs will be taken of selected sampling locations to show the surrounding area, site features, objects used to locate the site, and unusual conditions. The photographs will be used to provide backup documentation for procedures and unusual conditions encountered, as well as to identify general sampling locations. If possible, the photograph will be identified by an informational sign within the photograph itself. This sign will display the site name, initials of photographer, and date. After the photographs are downloaded, they will be labeled for cross-referencing with other field data and may be included in the RI/FS report.

2.3.5.3 SAMPLE IDENTIFICATION NUMBERS

All media samples collected to support this project will be identified by a unique ten-character number as described in the Data Management Plan (Attachment B to the Work Plan), and CLEAN PP T 2.2. The ten-character number will consist of a four-character CTO-based number, a four-character sample number, and a two-digit sequential container number. The CTO-based number for this investigation will be C077 (indicating CTO-0077).

The four-character sample number is designed to help the data user distinguish among multiple samples collected for the CTO. The first character of the identification number will be an alphabetic character identifying the type of sample (e.g., S for soil or G for groundwater), which will follow the four-character CTO number, C077. The sample number will be the sequential number of the sample for this CTO. For example, C077S123 will be the 123rd soil sample collected during CTO-0077. For field QC samples, the first character of the identification number is an alphabetic character

identifying the sample type (e.g., T for trip blank, F for source blank, or R for rinsate). For example, C077R006 will be the sixth equipment-rinsate sample collected during CTO-0077.

The two-digit sequential container number will follow the sample number. This container number will identify the multiple containers collected for an individual sample (e.g., 01 for first sample container, 02 for second sample container).

2.3.5.4 CHAIN-OF-CUSTODY RECORDS

COC records will document the transfer of sample custody from the time of sampling to laboratory receipt. SOP 10 (BNI 2004b) provides a description of COC procedures. COC forms will be completed by the sampler and will accompany the samples from the field to the analytical laboratory.

The custody record will be completed using waterproof ink. All corrections will be made by drawing a line through, initialing, and dating the error, and then entering the correct information. The error will remain legible after correction. All applicable information on the COC record, including signatures, will be filled out completely and legibly. Unused space (rows) for sample/analysis information will be crossed out, initialed, and dated. Samples requiring different turnaround times will not be included together on the same COC record. If samples are to be delivered to the laboratory by an overnight carrier, the airbill number will be recorded, and the COC record(s) will be placed in a waterproof plastic bag that will be taped to the lid inside the sample cooler prior to sealing.

Laboratory personnel will be responsible for acknowledging receipt of samples, recording the interior temperatures of shipping containers, and verifying that these containers have not been opened or damaged. They will also be responsible for maintaining custody and sample-tracking records throughout sample preparation and analysis. A copy of the COC form will be sent to the CLEAN Program office at the completion of analytical work.

2.3.5.5 CUSTODY SEALS

After samples are collected, custody seals will be placed on the sample containers. Custody seals will be used to detect any possible tampering between sample collection and analysis. The seal will be placed so that it must be broken to open the sample container. Two or more custody seals will be placed on the outside of the shipping container or cooler prior to shipment by an overnight carrier. Each custody seal affixed to sample containers and sample coolers will be signed and dated by the field sampler. Custody seals are described in SOP 10 (BNI 2004b). Clear packing tape will be placed over custody seals to prevent accidental breaks.

2.3.5.6 CORRECTIONS TO DOCUMENTATION

All original recorded data will be written in waterproof ink. No accountable, serialized documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on an accountable document assigned to an individual, that individual will correct the error by drawing a

line through it, initialing and dating it, and entering the correct information. The erroneous information will not be obliterated. Any subsequent error discovered on an accountable document will be corrected, initialed, and dated by the person who made the entry.

2.4 ANALYTICAL METHODS

Fixed-based laboratories will be used to analyze samples. Analytical methods, sample volumes, container types, and holding times for this project are listed in Tables 2-1 and 2-2. Tables 2-3 and 2-4 list target reporting limits for this project and regulatory comparison criteria. Detection limits and screening levels for previous and new data will be compared and evaluated in the RI report. Agriculture and Priority Pollutant Laboratories, Inc., will analyze most samples; Brooks Rand LLC will analyze groundwater samples for mercury down to a minimum of 0.1 nanogram per liter; and Environmental Geophysical Laboratory will analyze soil samples for geotechnical parameters.

2.5 QUALITY CONTROL

Analytical quality assurance (QA)/QC procedures encompass the requirements established by the Navy Installation Restoration Chemical Data Quality Manual (NFESC 1999), the Laboratory Technical Specification (BNI 2004a), and U.S. EPA method-specific criteria. These procedures will be provided by the laboratory QA program and supported by SOPs, and will address QC samples, instrument calibration, preventive maintenance, internal QC checks and corrective action, and data review and reporting.

Both field and laboratory QA/QC checks will be used to evaluate the performance of field and laboratory analytical procedures. QA/QC checks will take the form of samples introduced into the sampling, sample transport, and analytical stream to enable evaluation of analytical accuracy, precision, and representativeness.

Laboratory QC samples that will be used for assessing the impact of contamination on sample results include method blanks, calibration blanks, and instrument blanks. The laboratory will use these QC sample types in accordance with the Navy Installation Restoration Chemical Data Quality Manual (NFESC 1999), U.S. EPA method-specific requirements, and Laboratory Technical Specification, Section 4.11 (BNI 2004a). In addition, three kinds of field QC blanks will be used: trip blanks, equipment rinsate blanks, and source water blanks.

2.5.1 Field Blanks

Trip blanks are used to detect contamination introduced during sample handling and shipment. Trip blanks are prepared by the laboratory using contaminant-free reagent-grade water and are shipped to the field together with sample containers. They are not opened in the field and are returned to the laboratory in every sample cooler containing samples to be analyzed for VOCs and TPH as gasoline.

An equipment rinsate blank is a sample of contaminant-free water that has been passed through or over recently decontaminated field-sampling equipment. An equipment rinsate blank will be used to assess the adequacy of the equipment decontamination process as well as contaminant effects from handling, storage, shipment, and analysis. Equipment-rinsate blanks will be collected at a frequency of one per day per matrix.

Source-water blanks will be used to assess the potential for sample contamination from the final rinsewater of the decontamination process. One source water blank from each water source will be collected and analyzed for the same parameters as the related samples. After the initial source water blank sample, additional samples will only be collected when the source of rinsate water changes.

2.5.2 Laboratory Quality Control Analyses

A laboratory control sample (LCS) or method-blank spike sample and a method blank will be analyzed with each analytical/QC batch containing 20 or fewer project samples. A matrix spike (MS) and matrix spike duplicate (MSD) sample will be analyzed for organic parameters at a frequency of one set per 20 environmental samples or one per analytical/QC batch of analyzed samples, whichever is more frequent. An MS and MSD sample will be analyzed for metals and all inorganic parameters at a frequency of one set per 20 environmental samples. Surrogates will be added to samples for organic analyses as applicable.

2.5.3 Laboratory Quality Control Acceptance Criteria

At a minimum, the laboratory will maintain control charts for LCS analyses and will generate acceptance limits based on historical recoveries in accordance with the Laboratory Technical Specification (BNI 2004a). The acceptance limit for the method blank will be the detection limit. The laboratory will comply with limits for MS recovery, duplicate and MSD precision, and surrogate recovery, in accordance with the programmatic analytical DQOs in the Laboratory Technical Specification and U.S. EPA methods. Table 2-5 presents the accuracy and precision criteria for the methods to be used in this project.

The laboratory will take corrective action as required in the Laboratory Technical Specification (BNI 2004a) to correct or address out-of-control events. Such actions may include sample reextraction and/or reanalysis. Noncompliant QC results attributed to sample matrix effects will be documented and noted in the laboratory report.

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Laboratory instrument/equipment testing, inspection, and maintenance will be performed in accordance with SOP 6 (BNI 2004b) and the Laboratory Technical Specification (BNI 2004a).

Subcontractor laboratories will perform and maintain records of preventive maintenance on instruments used for analysis of project samples. Preventive maintenance documentation is incorporated into California laboratory certification requirements and is an element of the laboratory QA plan.

2.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Subcontractor laboratories will be required to document calibration procedures according to Section 4.6 of the Laboratory Technical Specification (BNI 2004a). These procedures will be subject to review by CLEAN Program auditors under the direction of the Program Quality Manager. Calibration procedures will be consistent with specified method requirements. Calibration of field equipment and instrumentation, and frequency of calibration, will be in accordance with the relevant CLEAN Program SOPs (BNI 2004b). Rented field equipment will be calibrated by rental companies in accordance with the manufacturer's instructions, prior to being shipped to field personnel.

2.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The CTO Leader is responsible for identifying and procuring supplies necessary for the project and for determining acceptance criteria for these items. The CTO Leader and the Database/Laboratory Services Supervisor will be responsible for coordination with the analytical laboratory and ensuring that appropriate sample containers are received. The field team will visually inspect the bottles, jars, and any other sampling containers received from the laboratory. If the containers or packaging appears to be damaged or tampered with, the containers will be rejected. The CTO Leader will also be responsible for receipt and inspection of all equipment used on the project. Containers of distilled or deionized water to be used on-site for field blanks and/or decontamination will be inspected by field personnel prior to use to ensure that caps and seals have not been broken or tampered with. Drums and bins for containment of IDW will be visually inspected by the field team for integrity and will be refused if found to be damaged or otherwise unacceptable.

2.9 NONDIRECT MEASUREMENTS

All nondirect measurement data will be reviewed completely for usability. Before these data are used, the Database/Laboratory Services Supervisor will review associated SOPs to determine compliance with CLEAN Program standards and inspect accompanying verification data. The Project Manager is responsible for obtaining approval from the Database/Laboratory Services Supervisor. Data will be validated by the same methods used to validate internally generated data.

2.10 DATA MANAGEMENT

Project data will consist of various types of information, ranging from field measurements to laboratory analytical results. Site data requirements for this project will be governed by the specific type of data and the DQOs. Unique data-type combinations will be

available to accommodate specific data collection and reporting needs for this project. Primary data management activities include establishing the sampling design; collecting, encoding, verifying, and validating data; evaluating data for QA/QC; and generating output.

Data management procedures are established by the CLEAN Program Data Management Plan (BNI 1993). Project-specific modifications are incorporated into the Data Management Plan, Attachment B to the Work Plan. Requirements for hard copy and electronic data deliverables are detailed in the Laboratory Technical Specification (BNI 2004a). Electronic deliverables to be loaded into the Bechtel Environmental Integrated Data Management System will also be submitted. Required project field and analytical data will be submitted to the Navy in accordance with NAVFAC Southwest Environmental Work Instruction No. 6 (NAVFAC Southwest 2005).

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Section 3
ASSESSMENT AND OVERSIGHT

QA oversight, performance and system audits, and corrective actions will be conducted in accordance with the CLEAN Program Quality Control Management Plan (BNI 1998), which describes the responsibilities to be fulfilled by CLEAN Program personnel and subcontractors to attain the designed level of quality. CLEAN Program or Navy personnel will evaluate compliance of the laboratory QA program and procedures with Navy Installation Restoration Chemical Data Quality Manual requirements (NFESC 1999). Oversight will include internal and external audits, documentation of findings, and reports of corrective action.

3.1 ASSESSMENTS AND RESPONSE ACTIONS

Audits and surveillances will be conducted to assure that work is accomplished by trained personnel using approved procedures. Corrective actions will be identified, tracked, and closed out in a timely manner.

3.1.1 Performance and System Audits

The analytical laboratory will be California-certified for analyses specified in this SAP and on the list of Naval Facilities Engineering Service Center-approved laboratories. Performance and system audits will be conducted by the Quality Manager, who will be assisted by various technical experts not directly responsible for accomplishing the work being reviewed. Field sampling activities, laboratories, and administrative activities will be audited. Analytical laboratories will be audited annually (approximately) by BEI or the Navy in accordance with the Navy Installation Restoration Chemical Data Quality Manual process (NFESC 1999), and reports will be provided to BEI and Navy management. Audits may be scheduled or unscheduled and will be conducted commensurate and in coordination with work activities.

3.1.2 Corrective Actions

Project activities that are found to be in noncompliance with quality requirements and cannot be resolved in the normal course of verification activities will be appropriately documented in accordance with approved procedures. Corrective action requests will be used to document noncompliance, corrective action commitments, and resolutions.

Corrective action will not be complete until the problem has been solved effectively and permanently. Follow-up action to assure that the problem remains corrected will be an important step in the corrective action process.

3.2 REPORTS TO MANAGEMENT

QA reports will be made monthly to CLEAN Program management. These reports will contain a discussion of the current status of the project, including results of performance and system audits, results of data quality assessments, problems, and methods to resolve the problems. In addition, the data quality assessment results for the project will be summarized and reported in the QA section of the RI report.

3.2.1 Quality Assurance Implementation

The CLEAN Program Quality Manager will assist the Navy Quality Assurance Officer (QAO) in documenting QA implementation. Documentation will provide evidence of compliance with specific QA activities required by this SAP, such as conduct of field and laboratory audits.

3.2.2 SAP Revision or Amendment

When circumstances that impact the original project DQOs arise, such as a significant change in work scope, this SAP document will be revised or amended. The modification process will be based on U.S. EPA guidelines and direction from the Navy RPM and QAO.

3.2.3 Data Quality Assessment

The process of data quality assessment will include review of analytical data by the project chemist, verification of hard copy and electronic results data, independent validation of data, and evaluation of overall data in terms of the precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria. Data evaluation will include an assessment of the results from field QC samples such as field blanks and equipment rinsate blanks.

Section 4
DATA VALIDATION AND USABILITY

Data quality management includes data review, verification, validation, and assessment; preventive maintenance; and corrective actions as described in this section.

4.1 DATA REVIEW, VERIFICATION, AND VALIDATION

Data validation and usability will be controlled through the review, verification, and validation processes described below.

4.1.1 Data Review

Project staff will review data for internal and external consistency in accordance with the CLEAN Program Technical Specification for Data Validation Services (BNI 1998). CLEAN Program Procedures (BNI 2004b) for performance, system audits, and corrective action oversight will be used. The CLEAN Program Quality Control Management Plan (BNI 1994) includes the requirements and responsibilities of all CLEAN Program personnel and subcontractors to attain the desired level of quality.

Requirements for performing laboratory analyses will be specified in the subcontracts for technical services under which the work will be performed. The subcontracts will specify deliverables, turnaround time, and performance standards. Receipt of required deliverables will be verified in the course of the contract compliance screening. Each data package will be reviewed against a checklist of deliverable requirements prepared on the basis of the subcontract and the project-specific needs. Outstanding items will be resolved before the project is closed.

4.1.2 Data Verification

Manual and electronic systems will be used to manage field and laboratory data. Data stored, evaluated, and reported electronically will be subject to 100 percent manual verification against hard copy data reports. Discrepancies will be corrected and documented according to the CLEAN Program Data Management Plan (BNI 1993).

4.1.3 Data Validation

Laboratory data will be validated in accordance with the Southwest Division Naval Facilities Engineering Command Environmental Work Instruction No. 1 (SWDIV 2001) and the CLEAN Program Technical Specification for Data Validation Services (BNI 1998) by a validation subcontractor independent of the laboratory. The data validation process will consist of a systematic assessment and verification of data quality through independent review. Validation must be performed by individuals who are not associated with the collection and analysis of samples, interpretation of sample data, or any decision-making process within the scope of the particular investigation. For the CLEAN Program, this is accomplished through the use of an independent third-party data validation subcontractor. Data validation procedures will be in accordance with

U.S. EPA Contract Laboratory Program (CLP) guidance, modified as necessary to accommodate non-CLP methods.

Level IV data validation follows the U.S. EPA protocols and CLP criteria set forth in the functional guidelines for evaluating organic and inorganic analyses (U.S. EPA 1994, 1999). Calculations will be checked for QC samples (e.g., MS/MSD and LCS data) and routine field samples (including field duplicates, field and equipment rinsate blanks, and VOC trip blanks). To assure that detection limits and data values are appropriate, instrument performance, method of calibration, and the original data for calibration standards will be evaluated.

For a Level III data validation effort, data values for routine and QC samples will be assumed to be correctly reported by the laboratory. Data quality will be assessed by comparing the QC parameters listed above with the appropriate criteria (or limits) as specified in the project SAP, by CLP requirements, or by method-specific requirements (e.g., CLP or SW-846).

Fixed-base laboratory data will be subjected to a data validation strategy appropriate for the intended use of the data.

An independent third-party subcontractor will perform a Level III data validation on 90 percent of the laboratory data and a Level IV data validation on the remaining 10 percent. The sampling data that receive Level IV validation will be selected randomly to obtain a representative data set, unless review of the first round of sampling data suggests focused data validation of specific sampling locations.

4.2 VERIFICATION AND VALIDATION METHODS

The process of data quality assessment will encompass data validation and review of internal technical data to evaluate the entire data set for the project. The assessment will consider each type of data, its relationship to the entire data set, and the adequacy of the data to fulfill the DQOs for the project. Data sets will be assessed for completeness and compliance with method-specific or project-specific QA/QC requirements, including results of the independent data validation process. Data validation will compare DQOs with the actual level of data quality obtained through evaluation by PARCC criteria and other method performance requirements. The assessment process will also evaluate data quality in terms of PARCC criteria and determine data usability for the intended purpose(s) as described below.

4.2.1 Precision and Accuracy

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is determined for analytical results using field and laboratory duplicates and duplicate MS samples. It is expressed in terms of the relative percent difference (RPD) as follows:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100$$

where

C_1 = concentration of sample or MS
C_2 = concentration of duplicate or MSD

Accuracy is the degree of agreement of a measurement (or an average of the same measurement type) with an accepted reference or true value. Accuracy of analytical determinations will be measured using laboratory QC analyses such as LCSs, MSs, and surrogate spikes. Accuracy is typically measured by evaluating the QC result against the concentration known to be added, expressed as percent recovery (%R) as follows:

$$\%R = \frac{S - U}{C_{sa}} \times 100$$

where

S = measured concentration of spiked aliquot
U = measured concentration of unspiked aliquot
C_{sa} = concentration of spike added

4.2.2 Representativeness

Representativeness is the reliability with which a measurement or measurement system reflects the true conditions under investigation. Representativeness is influenced by the number and location of the sampling points, sampling timing and frequency of monitoring efforts, and the field and laboratory procedures.

4.2.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. Data validation and data quality assessment will determine which data are valid and which data are rejected. Percent completeness is defined as follows:

$$Percent\ Completeness = \frac{V}{T} \times 100$$

where

V = number of valid (not rejected) measurements over a given time
T = total number of planned measurements

The overall completeness goal for this project will be 90 percent for all validated project data. As a data subset, the most critical data (as determined by the seven-step DQO process) will have a completeness goal of 100 percent.

4.2.4 Comparability

Comparability expresses the confidence with which one data set can be compared to another based on U.S. EPA-defined procedures, where available. If U.S. EPA procedures are not available, the procedures have been defined or referenced in this SAP.

The comparability of data will be established through well-documented methods and procedures, standard reference materials, QC samples and surrogates, and performance-evaluation study results, as well as by reporting each data type in consistent units. Analytical methods employed will be the same or equivalent for all rounds of sampling.

4.3 RECONCILIATION WITH USER REQUIREMENTS

Field and laboratory data will be managed using manual and electronic systems. If QA/QC audits or reviews of data indicate unacceptable data, samples will be reanalyzed if holding-time criteria permit. If the requirements are not met following reanalysis, the Database/Laboratory Services Supervisor will be responsible for developing and initiating corrective action. The Quality Manager will be responsible for assessing whether the selected corrective action is adequate.

Corrective action may include reanalyzing samples (if holding-time criteria permit), resampling and analyzing, evaluating and amending established sampling and analytical procedures, or reevaluating DQOs.

Section 5
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FIGURES

FINAL WORK PLAN
FOR REMEDIAL INVESTIGATION IR SITE 35
AREAS OF CONCERN
IN TRANSFER PARCEL EDC-5

DATED 13 MARCH 2006

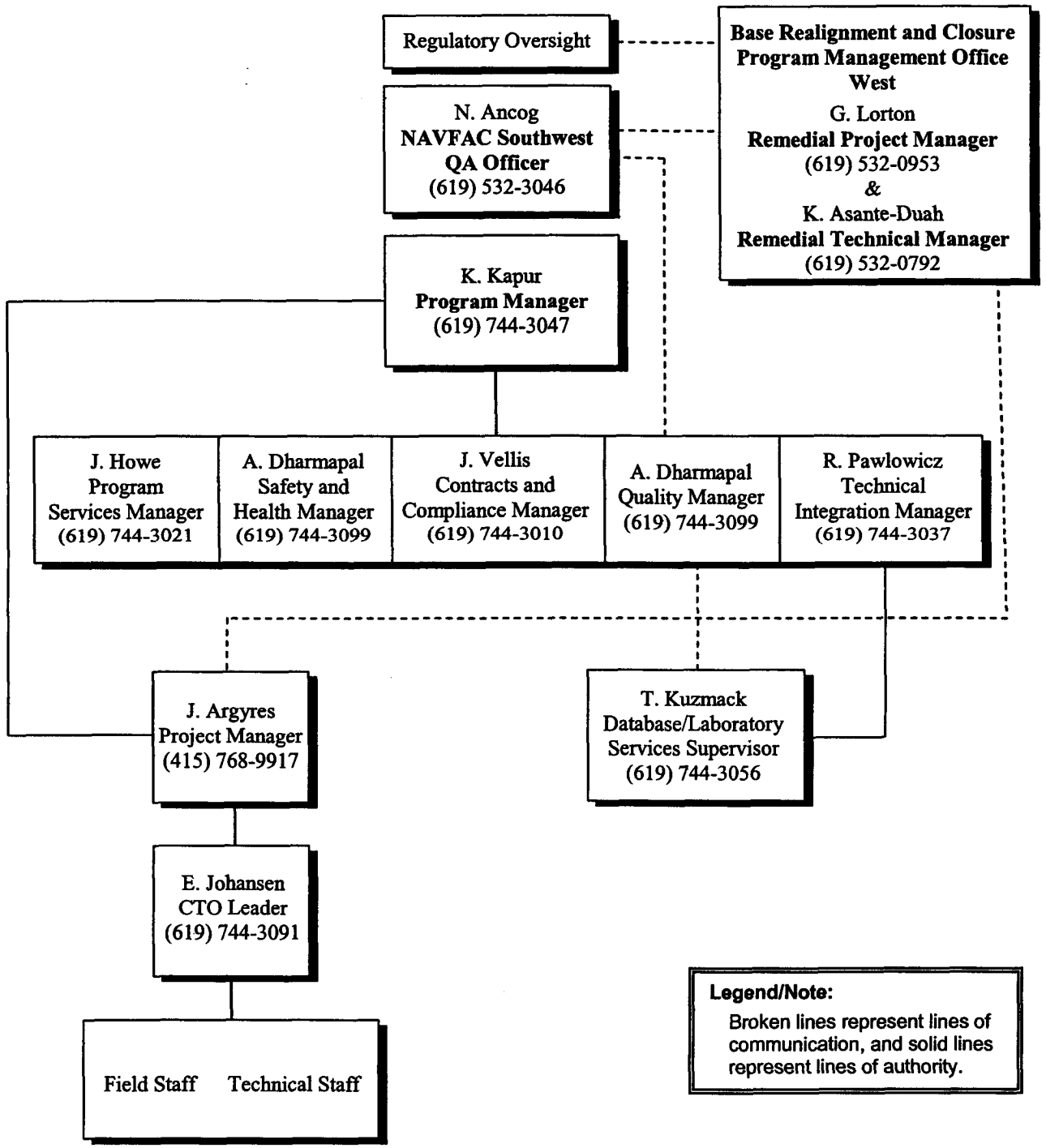
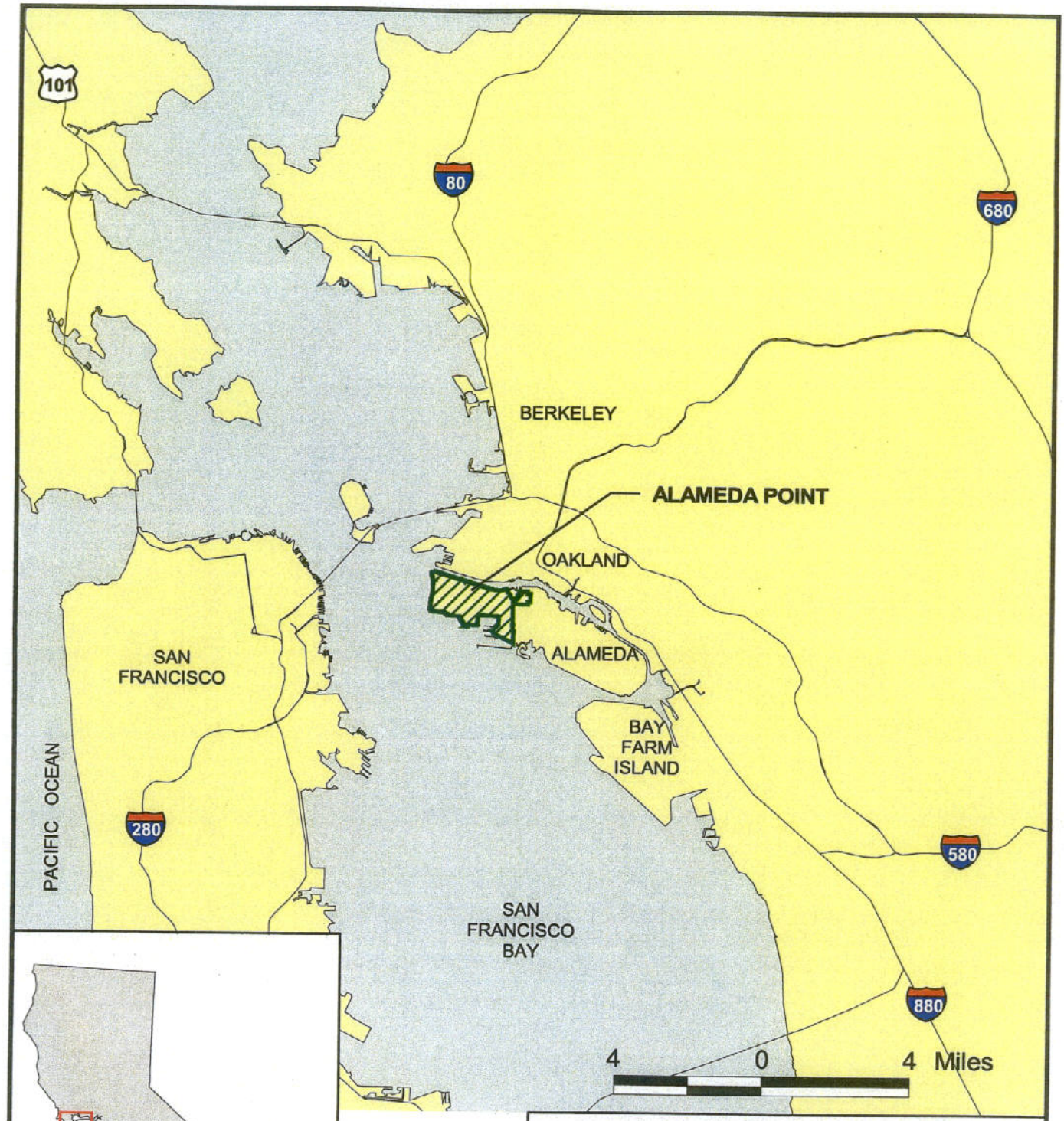


Figure 1-1
Project Organization Chart

Revised 09/28/05



Sampling and Analysis Plan for IR Site 35

Figure 1-2

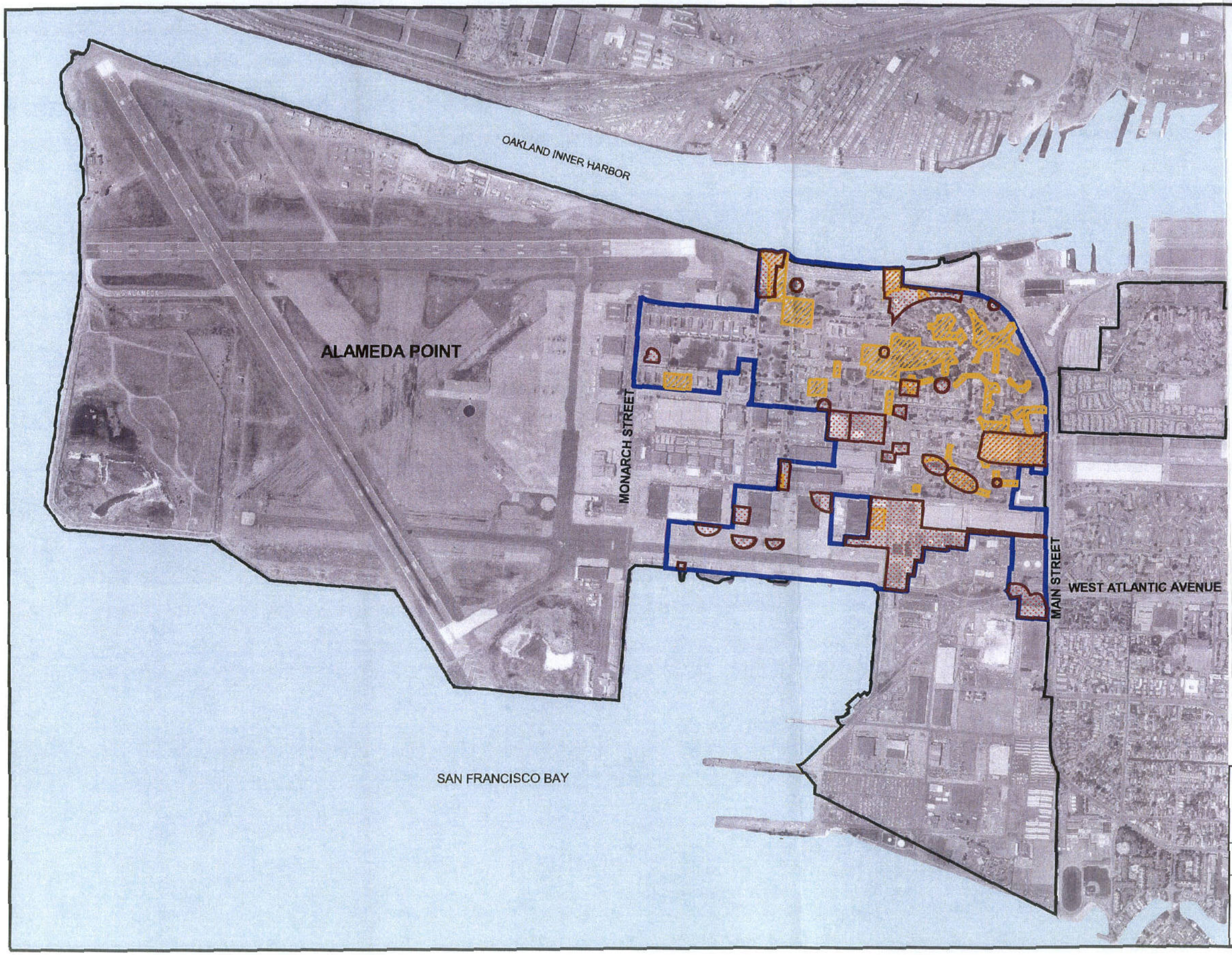
Alameda Point Regional Map

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 9/20/05
File No.: 077R14038
Job No.: 23818-077
Rev No.: C



LEGEND

- IR SITE 35 AOCS AND DATA GAP AREAS
- IR SITE 35 PAH AREA
- TRANSFER PARCEL EDC-5 BOUNDARY
- NAVY ONSHORE PROPERTY BOUNDARIES
- WATER

NOTES:

EDC – ECONOMIC DEVELOPMENT CONVEYANCE

IR – INSTALLATION RESTORATION (PROGRAM)

N

1200 0 1200 Feet

Sampling and Analysis Plan for IR Site 35

Figure 1-3

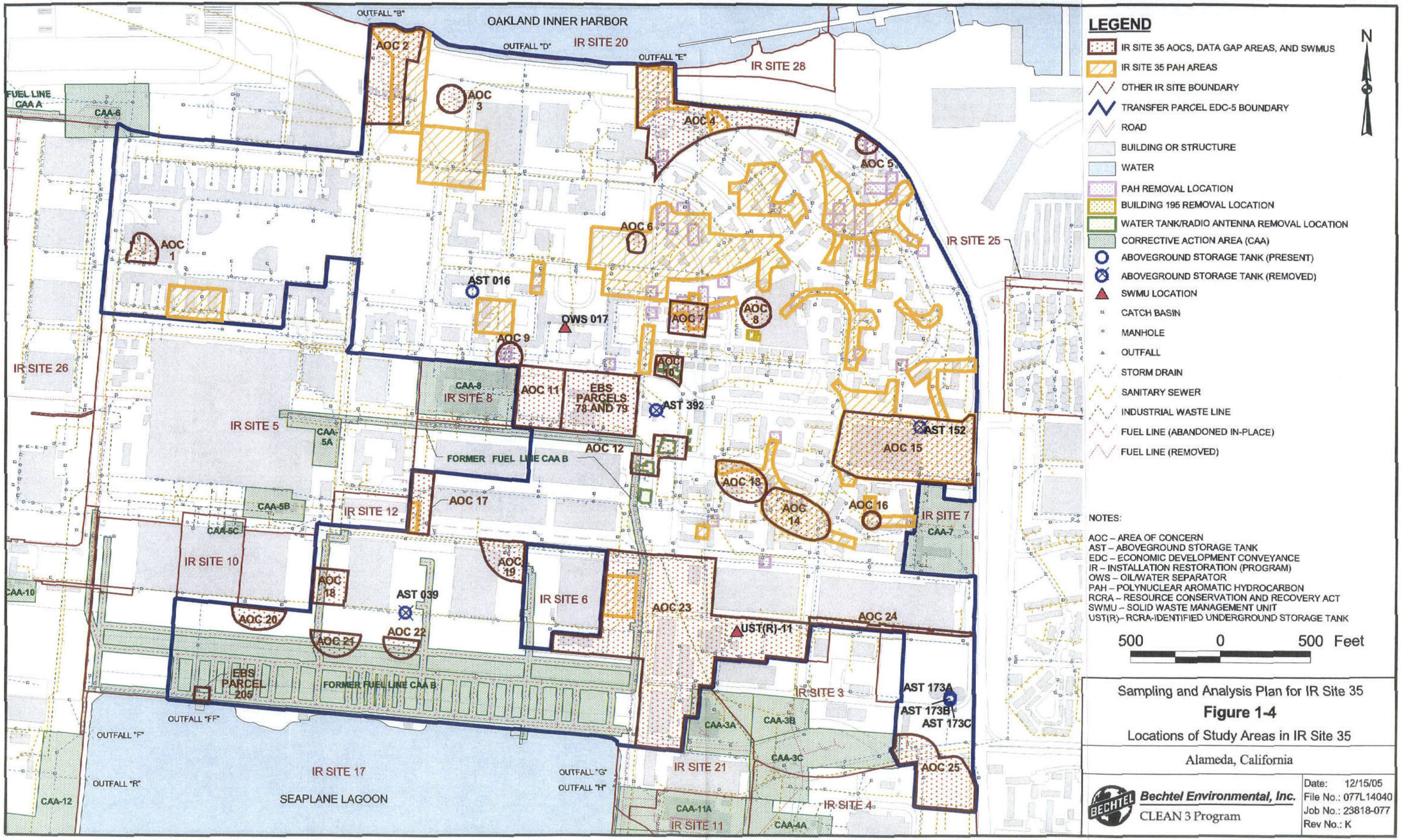
Site Location Map

Alameda, California

Bechtel Environmental, Inc.

CLEAN 3 Program

Date: 12/16/05
File No.: 077L14039
Job No.: 23818-077
Rev No.: H



Sampling and Analysis Plan for IR Site 35

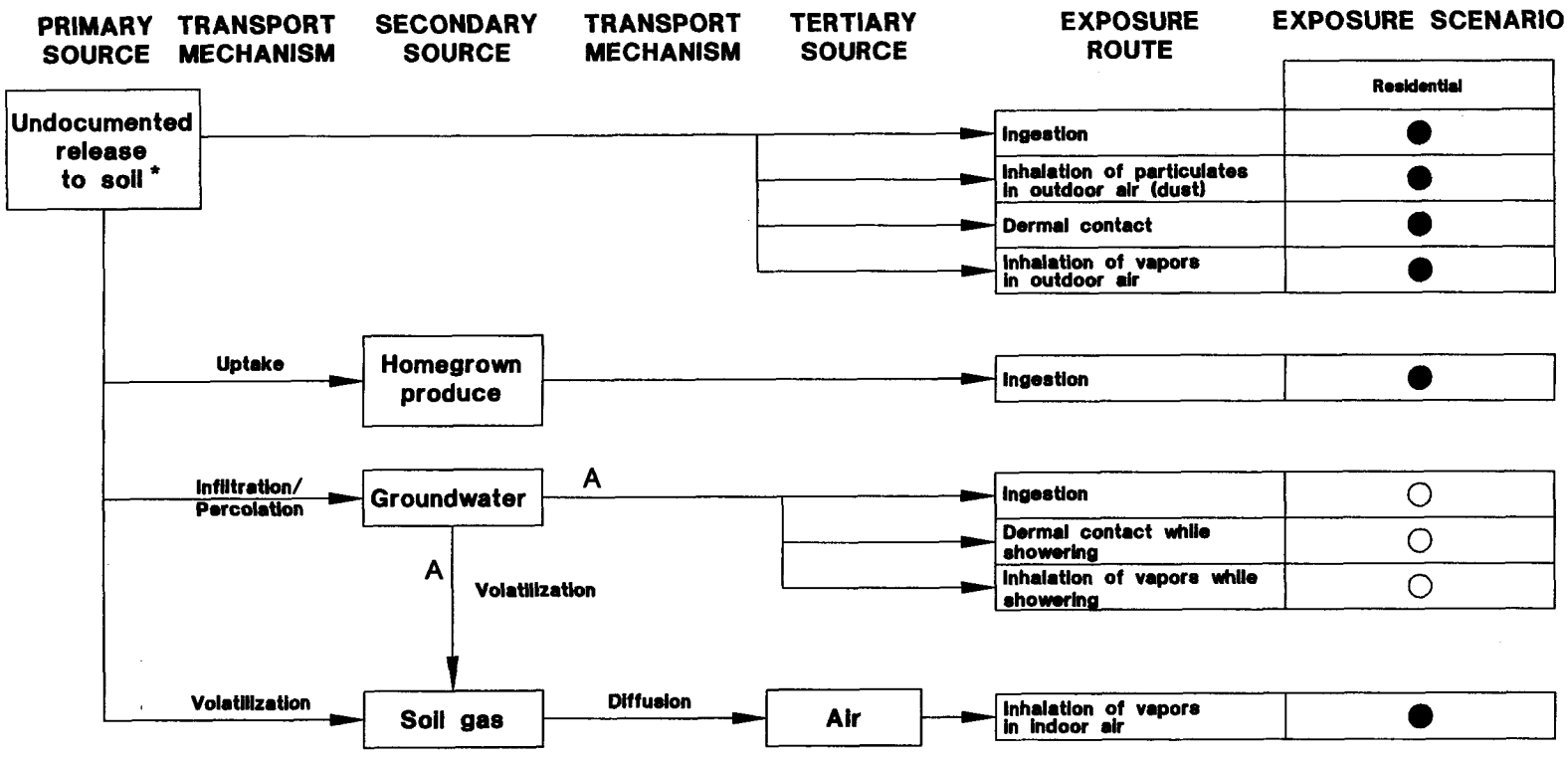
Figure 1-4

Locations of Study Areas in IR Site 35

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/15/05
File No.: 077L14040
Job No.: 23818-077
Rev No.: K



LEGEND

- ● POTENTIALLY COMPLETE EXPOSURE PATHWAY
- ○ POTENTIALLY COMPLETE EXPOSURE PATHWAY; CONSIDERED AN UNLIKELY PATHWAY, BUT WILL BE EVALUATED IN THE HUMAN-HEALTH RISK ASSESMENT
- A THESE PATHWAYS WILL NOT BE INCLUDED FOR AREAS WITHOUT GROUNDWATER DATA

NOTE:

* 0–10 FEET BELOW GROUND SURFACE OR 0 FEET TO GROUNDWATER, WHICHEVER COMES FIRST

Sampling and Anaylsis Plan for IR Site 35

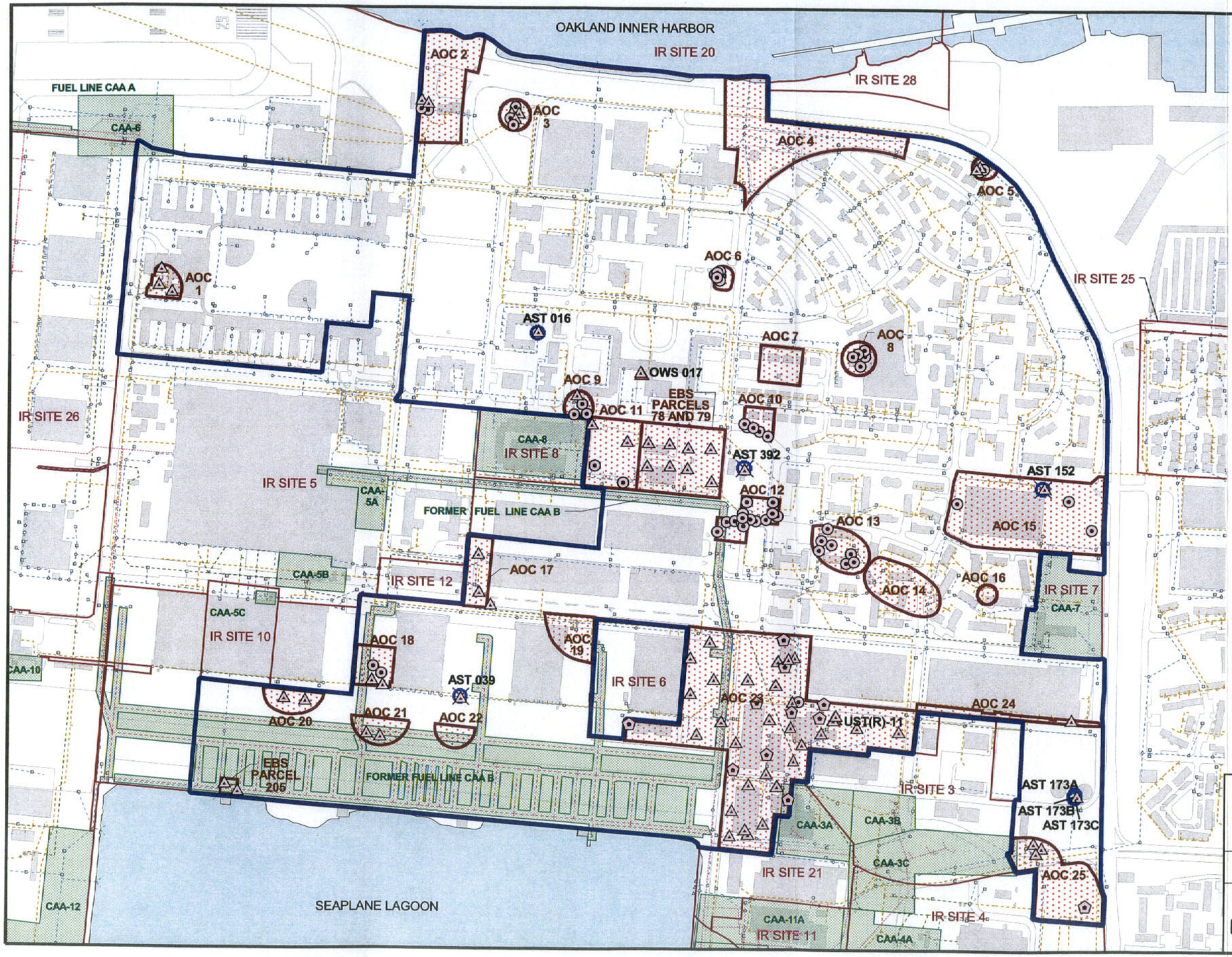
Figure 1-5

Conceptual Site Model

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 12/8/05
File No: 077C14010
Job No: 23818-077
Rev No: G



LEGEND

- IR SITE 35 AOCS, DATA GAP AREAS, AND SWMUS
- OTHER IR SITE BOUNDARY
- TRANSFER PARCEL EDC-5 BOUNDARY
- ROAD
- BUILDING OR STRUCTURE
- WATER
- CORRECTIVE ACTION AREA (CAA)
- ABOVEGROUND STORAGE TANK (PRESENT)
- ABOVEGROUND STORAGE TANK (REMOVED)
- SWMU LOCATION
- CATCH BASIN
- MANHOLE
- OUTFALL
- STORM DRAIN
- SANITARY SEWER
- INDUSTRIAL WASTE LINE
- FUEL LINE (ABANDONED IN-PLACE)
- FUEL LINE (REMOVED)
- PROPOSED SOIL SAMPLING LOCATION
- PROPOSED GROUNDWATER SAMPLING LOCATION
- PROPOSED SOIL AND GROUNDWATER SAMPLING LOCATION

N

NOTES:

AOC – AREA OF CONCERN
AST – ABOVEGROUND STORAGE TANK
EDC – ECONOMIC DEVELOPMENT CONVEYANCE
IR – INSTALLATION RESTORATION (PROGRAM)
OWS – OIL/WATER SEPARATOR
PAH – POLYNUCLEAR AROMATIC HYDROCARBON
RCRA – RESOURCE CONSERVATION AND RECOVERY ACT
SWMU – SOLID WASTE MANAGEMENT UNIT
UST(R)– RCRA-IDENTIFIED UNDERGROUND STORAGE TANK

500 0 500 Feet

Sampling and Analysis Plan for IR Site 35

Figure 1-6

Proposed Sampling Locations at IR Site 35 AOCs, Data Gap Areas, and SWMUs

Alameda, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 1/12/06
File No.: 077L14134
Job No.: 23818-077
Rev No.: G

TABLES

FINAL WORK PLAN
FOR REMEDIAL INVESTIGATION IR SITE 35
AREAS OF CONCERN
IN TRANSFER PARCEL EDC-5

DATED 13 MARCH 2006

Table 1-1
Key Personnel

Name	Organization	Role	Responsibilities	Contact Information
Greg Lorton	BRAC Program Management Office West	Remedial Project Manager	Directly responsible for project execution and coordination with regulatory agencies and the BRAC management team	BRAC Program Management Office West, San Diego, California gregory.lorton@navy.mil (619) 532-0953
Kofi Asante-Duah	BRAC Program Management Office West	Remedial Technical Manager	Directly responsible for project technical issues, including review of all relevant documents prepared as part of this CTO	BRAC Program Management Office West, San Diego, California kofi.asante-duah@navy.mil (619) 532-0792
Narciso Ancog	NAVFAC Southwest	QA Officer	Provides government oversight of the QA program, including review and sign-off of SAPs; provides quality-related direction to the CLEAN Program Quality Manager; has authority to suspend affected projects or site activities if NAVFAC Southwest-approved quality requirements are not maintained	Naval Facilities Engineering Command Southwest, San Diego, California narciso.ancog@navy.mil (619) 532-3046
Gregory Grace	Navy ROICC San Francisco Bay Area	ROICC Project Engineer	Supervises construction projects; ensures the health and safety of workers, residents, and visitors on the base; coordinates the fieldwork of all contractors who perform daily activities at Alameda Point	Navy ROICC Alameda, California gregory.grace@navy.mil (510) 749-5940
Doug DeLong	DoD BRAC Program Management Office	Environmental Compliance Manager	Coordinates fieldwork at Alameda Point with the City of Alameda and local community (residents, business owners, tenants, and operators); notifies off-site authorities in the event of a spill	DoD BRAC Program Management Office San Francisco, California douglas.delong@navy.mil (415) 743-4713
Krish Kapur	BEI	Program Manager	Responsible for all aspects of the CLEAN Program, including assigning adequate resources to complete the work, to conduct technical reviews of deliverables, and to perform field operations	Bechtel Environmental, Inc. San Diego, California kkapur@bechtel.com (619) 744-3047
Janet Argyres	BEI	Project Manager	Supervises all work performed at Alameda Point under the CLEAN Program contract, including project planning, scheduling, staffing, executing tasks and subcontracts, and managing deliverables	Bechtel Environmental, Inc. San Francisco, California jlargyre@bechtel.com (415) 768-9917

Table 1-1 (continued)

Name	Organization	Role	Responsibilities	Contact Information
Eric Johansen	BEI	CTO Leader	Responsible for day-to-day supervision of staff and coordination of tasks for CTO project completion; responsible for production of deliverables, oversight of data review and management, and QA	Bechtel Environmental, Inc. San Diego, California eajohans@bechtel.com (619) 744-3091
Anil Dharmapal	BEI	Quality Manager	Responsible for developing the QA process and supervising audits of projects for compliance with program procedures and specifications; has the authority to suspend site or project activities if quality standards are not maintained	Bechtel Environmental, Inc. San Diego, California apdharma@bechtel.com (619) 744-3099
Rich Pawlowicz	BEI	Technical Integration Manager	Oversees the technical quality of project deliverables; provides quality control; responsible for technical staffing and innovative technologies	Bechtel Environmental, Inc. San Diego, California rmpawlow@bechtel.com (619) 744-3037
Anil Dharmapal	BEI	Safety and Health Manager	Responsible for developing and implementing the Program Safety and Health Plan and project- or CTO-specific modifications and amendments	Bechtel Environmental, Inc. San Diego, California apdharma@bechtel.com (619) 744-3099
Jim Howe	BEI	Program Services Manager	Assists the CTO Leader and the Project Manager by reporting on project budgets, schedules, and costs	Bechtel Environmental, Inc. San Diego, California jghowe@bechtel.com (619) 744-3021
Jack Vellis	BEI	Contracts and Compliance Manager	Responsible for solicitation, selection, and award and management of purchase orders and subcontracts for services and materials required for the project	Bechtel Environmental, Inc. San Diego, California jdvellis@bechtel.com (619) 744-3010
Toni Kuzmack	BEI	Database/Laboratory Services Supervisor	Responsible for management of the database, which is the repository of data gathered in the course of the project; responsible for selection, coordination, technical oversight, and management of analytical laboratory and data validation subcontracts and services	Bechtel Environmental, Inc. San Diego, California amkuzmac@bechtel.com (619) 744-3056

Table 1-1 (continued)

Acronyms/Abbreviations:
BEI – Bechtel Environmental, Inc.
BRAC – Base Realignment and Closure
CLEAN – Comprehensive Long-Term Environmental Action Navy
CTO – contract task order
DoD – Department of Defense
NAVFAC – Naval Facilities Engineering Command
QA – quality assurance
ROICC – Resident Officer in Charge of Construction
SAP – sampling and analysis plan

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Table 1-2
Data Quality Objectives for AOCs and Data Gap Areas at IR Site 35

STEP 1 State the Problem	STEP 2 Identify the Decisions	STEP 3 Identify Decision Inputs	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Specify Tolerable Limits on Decision Errors	STEP 7 Optimize the Sampling Design
An RI will be conducted for several areas within Transfer Parcel EDC-5 (referred to as IR Site 35) identified by the Navy and regulatory agencies as needing further evaluation before early property transfer can occur. To accomplish this objective, the RI, FS, Proposed Plan, and ROD will be conducted on an accelerated schedule. Areas requiring further evaluation were initially identified in the final SI Report for Transfer Parcel EDC-5 (BEI 2005). This report recommended further evaluation of 25 AOCs based on a combined assessment of the historical uses of the EBS parcels, the results of data evaluation, risk evaluation, and input received from regulatory agencies. After the final SI Report was issued, the Navy and regulatory agencies refined the areas that they deemed necessary for additional evaluation and sampling. It was agreed that: • 2 AOCs (AOC 19 and 22) will be removed from IR Site 35 and included in adjacent IR Site 6 and CAA-B, respectively; • 19 AOCs (AOCs 1, 2, 3, 5, 6, 8 through 13, 15, 17, 18, 20, 21, 23, 24, and 25) require additional sampling and analysis; and • 4 AOCs (AOCs 4, 7, 14, and 16) have sufficient data to evaluate risk to human health. The regulatory agencies requested additional sampling at: • three data gap areas (EBS Parcels 78, 79, and 205) and • nine SWMUs (OWS 017, AST 016, AST 039, AST 152, AST 173A, AST 173B, AST 173C, AST 392, and UST[R]-11). PAH areas were also added to IR Site 35 in response to comments from U.S. EPA and DTSC on the draft version of this Work Plan. PAH areas identified for	Decisions will be based on a compilation of IR Site 35-specific data gathered during previous investigations and the proposed field investigation. These data, along with results of a human-health risk assessment, will be used to answer the following questions. • Have the nature and extent of contamination been defined? • Are contaminants present in soil or groundwater at concentrations that pose unacceptable risk to potential future residents? • Are contaminants present in groundwater at concentrations that could pose unacceptable risk to potential aquatic receptors in Oakland Inner Harbor or Seaplane Lagoon?	Data inputs will be chemical and geotechnical data, including concentrations of target chemicals in soil and groundwater collected during previous investigations and the IR Site 35 RI. Data from adjacent IR sites will also be reviewed to assess whether contaminants are associated with these sites or historical IR Site 35 activities. Also included are human-health risk assessment inputs, assumptions, and results. Soil and groundwater data will be compared to the following criteria: • Alameda Point comparison criteria for PAHs in soil (DON 2001a) • RWQCB ESLs for petroleum-contaminated sites (RWQCB 2005) • U.S. EPA Region 9 or California-modified residential PRGs for contaminants in soil (U.S. EPA 2004) • Alameda Point background concentrations for metals in soil and groundwater The Navy and regulatory agencies have initiated discussions to revisit the background concentrations and the data set for Alameda Point at a meeting held on October 18, 2005 (DON 2005a). The following comparison criteria that will be used in the RI report will reflect any updated agreements reached by the time that the RI report is prepared: • MCLs for contaminants in groundwater • California Toxics Rule for contaminants in groundwater	The boundaries of the study area are as follows. • The lateral boundaries will include the AOCs, data gap areas, and SWMUs, as shown on Figure 1-4. The boundaries may need to be revised based on the RI/FS results. • The vertical soil boundary will be the vadose zone. • The vertical groundwater boundary will be 5 to 10 feet below the water table (to allow for sufficient sample volume). • The temporal boundary will be determined by the timing of the fieldwork. As agreed by the regulatory agencies in telephone conference calls held on November 14 and 21, fieldwork was initiated on November 29, 2005, before the Work Plan was finalized (DON 2005b).	Data from previous investigations and data collected during this investigation will be used to evaluate the nature and extent of contamination. The following general decision rules will be applied. • If the nature and extent of contamination have been defined (based on comparison criteria in Step 3), then no further assessment will be recommended. • If the extent of contamination has not been defined, and data show that contamination is associated with an adjacent IR site(s), then outstanding delineation issues will be addressed by the adjacent IR site(s). • If the extent of contamination has not been defined, and data are not sufficient to support performing a human-health risk assessment and an FS (if there are sufficient data available to assess the nature and magnitude of contamination), then further delineation will be recommended. If follow-up delineation is performed, results will be submitted in an RI addendum. • If the extent of contamination has not been defined, but data are sufficient to support performing a human-health risk assessment and an FS (if there are sufficient data available to assess the nature and magnitude of contamination), then a risk assessment will be performed as part of the RI. If results of the human-health risk assessment indicate unacceptable risk, then further delineation may be recommended to support a removal action or inclusion as a component of remedial alternatives in the FS. Human-health risk will be assessed for individual areas at IR Site 35. The risk assessment approach and a discussion of acceptable risk are presented in the Human-Health Risk Assessment Work Plan, which is Attachment E to the Work Plan. The following general decision rules will be applied. • If human-health risk assessment results indicate acceptable risk, then no further action will be recommended. • If human-health risk assessment results indicate unacceptable risk, then further	Site-specific sampling objectives limit the use of statistical methods for selecting sampling locations at IR Site 35. Judgmental sampling has been chosen by the Navy and regulatory agencies to further assess the nature and extent of contamination in specific areas. Because judgmental sampling will be used, statistical limits on decision errors are not quantifiable. The most severe study decision error would be to conclude that action is not required when an unacceptable level of human-health risk actually exists. Data collected during the RI will be evaluated conservatively.	The sampling design was developed to generate data to meet the DQOs. The sampling strategy uses judgmental sampling to provide additional data for assessment of issues identified in various areas. Soil and discrete groundwater samples to be collected during this investigation are summarized for each area in Appendix A1 to this SAP. Samples will be analyzed using one or more of the following methods, as agreed to by the Navy and regulatory agencies: • VOCs, using U.S. EPA Methods 5035A and 8260B • TPH, using U.S. EPA Method 8015-M for purgeable-range hydrocarbons and U.S. EPA Method 8015B-M for extractable-range hydrocarbons • SVOCs, using U.S. EPA Method 8270C (with SIM for PAHs [some samples will be analyzed for PAHs only]) • pesticides, using U.S. EPA Method 8081A • PCBs, using U.S. EPA Method 8082 • metals, using U.S. EPA Method 6010B/7000 Series Groundwater samples will also be analyzed for TDS using U.S. EPA Method 160.1 if sufficient volume can be obtained. Selected groundwater samples will be analyzed for hexavalent chromium using U.S. EPA Method 7196A and mercury using U.S. EPA Method 1631 to detect concentrations down to 0.1 nanogram per liter. The number of proposed borings and samples, types of samples, soil sample depths, and chemical analyses were agreed to by the Navy and regulatory agencies at four planning meetings held from May through July 2005, and refined in two telephone conference calls with DTSC on November 17 and 21 (San Francisco Bay RWQCB staff

Table 1-2 (continued)

STEP 1 State the Problem	STEP 2 Identify the Decisions	STEP 3 Identify Decision Inputs	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Specify Tolerable Limits on Decision Errors	STEP 7 Optimize the Sampling Design
inclusion in the FS address residual B(a)P equivalent concentrations that are above the Alameda Point screening criterion of 620 micrograms per kilogram but do not drive risk above 10^{-5}. No additional samples are proposed in the PAH areas that are outside of AOCs. Also, as agreed upon with U.S. EPA on November 14, 2005, baseline risks will not be calculated for the PAH areas. The AOCs, data gap areas, and SWMUs are listed in Table 1-5 and on Figure 1-4. The boundaries of some areas of IR Site 35 shown on Figure 1-4 may need to be revised based on the RI/FS results. Specific problem statements for the individual AOCs, data gap areas, and SWMUs are detailed in Appendix A1 to this SAP.		at areas adjacent to or near surface-water bodies (i.e., AOCs 2, 3, 4, 20, 21, and the southern portion of 23; and EBS Parcel 205)		action will be recommended (e.g., removal action, inclusion of that area in the FS). Data from previous investigations and data collected during this investigation will be used to evaluate whether contaminants are present in groundwater at concentrations that potentially could pose unacceptable risk to potential aquatic receptors in Oakland Inner Harbor or Seaplane Lagoon. The following general decision rules will be applied. • If contaminant concentrations in groundwater at AOCs adjacent to or near surface water are below ecological comparison criteria, then it will be concluded that risk to potential aquatic receptors is acceptable, and no further action will be recommended. • If contaminant concentrations in groundwater at AOCs adjacent to or near surface water are above ecological comparison criteria, then further action may be recommended (e.g., additional sampling, modeling).		participated in a portion of the November 21 conference call) (DON 2005b). Soil samples from selected locations and depths will be analyzed for the following physical (geotechnical) soil characteristics to support risk assessment modeling, fate-and-transport assessment, and FS evaluations: • air permeability • density and moisture content • effective porosity • grain-size distribution • liquid limits • hydraulic conductivity • total organic carbon Sampling designs for the individual AOCs, data gap areas, and SWMUs are detailed in Appendix A1 to this SAP.

Acronyms/Abbreviations:
AOC – area of concern
AST – aboveground storage tank
B(a)P – benzo(a)pyrene
CAA – corrective action area
DQO – data quality objective
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
EBS – environmental baseline survey
EDC – economic development conveyance
ESL – environmental screening level
FS – feasibility study
IR – Installation Restoration (Program)
MCL – maximum contaminant level
OWS – oil/water separator
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
PRG – preliminary remediation goal
RI – remedial investigation
ROD – record of decision
RWQCB – (California) Regional Water Quality Control Board
SAP – sampling and analysis plan
SI – site inspection
SIM – selected ion monitoring
SVOC – semivolatile organic compound
SWMU – solid waste management unit
TDS – total dissolved solids
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
UST – underground storage tank
VOC – volatile organic compound

Table 1-3
Data Quality Objectives for Oil/Water Separators at IR Site 35

STEP 1 State the Problem	STEP 2 Identify the Decisions	STEP 3 Identify Decision Inputs	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Specify Tolerable Limits on Decision Errors	STEP 7 Optimize the Sampling Design
The regulatory agencies requested further evaluation of the following OWSs within Transfer Parcel EDC-5 as part of the IR Site 35 RI/FS: • OWS 063A, B, and C (located in AOC 1) • OWS 12A and B (located in AOC 20) • OWS 067 (located in AOC 23) • OWS 118 (located in AOC 24) • OWS 017 (identified as a SWMU outside of the AOCs) All OWSs are proposed for removal by the Navy or City of Alameda in preparation for site redevelopment. It is anticipated that impacted soil will be removed and that soil samples will be collected and analyzed as part of these removal activities. The timing for removal of the OWSs, however, has not been determined and the soil data generated may not be available for this RI/FS. Groundwater will need to be sampled and analyzed to aid in the assessment of whether releases have occurred at the OWS sites. The Work Plan, therefore, includes the collection and analysis of soil and groundwater samples to aid in the determination of whether a release may have occurred.	Decisions regarding OWSs will be based on evaluation of the analytical results generated from targeted soil samples. These data will be used to make the following decision. • Are contaminants present in soil that indicate releases have occurred from the OWSs? Groundwater data targeting the OWSs will be combined with other area-specific data to evaluate the nature and extent of contamination and human-health risk. Results of human-health risk assessments will be used to make the following decision. • Have the nature and extent of contamination been defined? • Are contaminants present at concentrations that contribute to an unacceptable risk to potential future residents?	Data inputs will be chemical and geotechnical data, including concentrations of target chemicals in soil and groundwater collected during previous investigations and during the IR Site 35 RI. Also included are risk assessment inputs, assumptions, and results. Data associated with the OWSs will be compared with the following criteria: • RWQCB ESLs for petroleum-contaminated sites (RWQCB 2005) • U.S. EPA Region 9 or California-modified residential PRGs for soil (U.S. EPA 2004) • Alameda Point background concentrations for metals in soil and groundwater. The Navy and regulatory agencies have initiated discussions to revisit background concentrations and the data set for Alameda Point at a meeting held on October 18, 2005 (DON 2005a). The comparison criteria that will be used in the RI report will reflect any updated agreements reached by the time that the RI report is prepared. • MCLs for contaminants in groundwater None of the OWSs are located near surface water; therefore, groundwater results will not be compared to surface water criteria.	The boundaries associated with OWSs at IR Site 35 are the following. • The lateral study boundaries will encompass the immediate vicinity of each OWS. • The vertical soil boundary will be the vadose zone. • The vertical groundwater boundary will be 5 to 10 feet below the water table (to allow for sufficient sample volume), or the bottom of the OWS, if it is deeper than 10 feet bgs. • The temporal boundary will be determined by the timing of the fieldwork. As agreed by the regulatory agencies in telephone conference calls held on November 14 and 21, fieldwork was initiated on November 29, 2005, before the Work Plan was finalized (DON 2005b).	Soil results will be compared to criteria in Step 3. The following general decision rules will be applied. • If soil contaminant concentrations are below comparison criteria, then removal of additional soil during the OWS removal will not be necessary. • If soil contaminant concentrations are above comparison criteria, then removal of additional soil during the OWS removal will be recommended. Any additional characterization of the extent of contamination will be performed at that time. Discrete groundwater results will be combined with other area-specific data to evaluate the nature and extent of contamination. The following general decision rules will be applied. • If the nature and extent of contamination have been defined (based on comparison criteria in Step 3), then no further assessment will be recommended. • If the extent of contamination has not been defined, and data are not sufficient to support performing a human-health risk assessment and an FS, then further delineation will be recommended. If follow-up delineation is performed, results will be submitted in an RI addendum. • If the extent of contamination has not been defined, but data are sufficient to support performing a human-health risk assessment and an FS (if there are sufficient data available to assess the nature and magnitude of contamination), then a risk assessment will be performed as part of the RI. If results of the human-health risk assessment indicate unacceptable risk, then further delineation may be recommended to support a removal action or inclusion as a component of remedial alternatives in the FS. Discrete groundwater results will be combined with other area-specific data to evaluate human-health risk. Since it is presumed that impacted soil associated with OWSs will be removed, these data will not be included in the evaluation of human-health risk. The following general decision rules will be applied.	Site-specific sampling objectives limit the use of statistical methods for selecting sampling locations to target OWSs. Judgmental sampling has been chosen by the Navy and regulatory agencies to further assess whether soil or groundwater has been impacted by possible releases from OWSs. Because judgmental sampling will be used, statistical limits on decision errors are not quantifiable. The most severe study decision error would be to conclude that action is not required when an unacceptable level of human-health risk actually exists. Data collected during the RI will be evaluated conservatively.	The sampling design was developed to generate data to meet the DQOs and in accordance with regulator agency requests. Soil and discrete groundwater samples will be collected (using the direct-push sampling method) from one boring adjacent to and on the estimated downgradient side (where possible) of each OWS; two or three soil samples will be collected from each boring (0 to 2, 2 to 4, and 4 to 8 feet bgs). A groundwater sample will be collected from a soil boring beneath each OWS (if the depth is available) using a HydroPunch or an equivalent sampling method. Soil and discrete groundwater samples will be analyzed for some or all of the following chemicals, as agreed to by the Navy and regulatory agencies: • VOCs, using U.S. EPA Methods 5035A and 8260B • TPH, using U.S. EPA Method 8015B-M for extractable-range hydrocarbons • metals, using U.S. EPA Method 6010B/7000 Series Groundwater samples will also be analyzed for TDS using U.S. EPA Method 160.1, if sufficient volume can be obtained.

Table 1-3 (continued)

STEP 1 State the Problem	STEP 2 Identify the Decisions	STEP 3 Identify Decision Inputs	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Specify Tolerable Limits on Decision Errors	STEP 7 Optimize the Sampling Design
				• If human-health risk assessment results indicate acceptable risk, then no further action will be recommended. • If human-health risk assessment results indicate unacceptable risk, then further action will be recommended (e.g., removal action, inclusion of the area in the FS).		

Acronyms/Abbreviations:
AOC – area of concern
bgs – below ground surface
DQO – data quality objective
EDC – economic development conveyance
ESL – environmental screening level
FS – feasibility study
IR – Installation Restoration (Program)
MCL – maximum contaminant level
OWS – oil/water separator
PRG – preliminary remediation goal
RI – remedial investigation
RWQCB – (California) Regional Water Quality Control Board
SWMU – solid waste management unit
TDS – total dissolved solids
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

Table 1-4
Data Quality Objectives for ASTs and One UST at IR Site 35

STEP 1 State the Problem	STEP 2 Identify the Decisions	STEP 3 Identify Decision Inputs	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Specify Tolerable Limits on Decision Errors	STEP 7 Optimize the Sampling Design
Seven ASTs (ASTs 016, 039, 152, 173A, 173B, 173C, and 392) and one UST (UST[R]-11) were identified as SWMUs for further evaluation under IR Site 35. In a letter to the DTSC and San Francisco Bay RWQCB dated July 26, 2005, the Navy requested that the seven above-mentioned ASTs be removed from the list of SWMUs evaluated in Transfer Parcel EDC-5 because they were known to contain only petroleum hydrocarbons, and would therefore meet the CERCLA petroleum exclusion criteria. DTSC responded in a letter dated August 29, 2005, and acknowledged that this issue falls under the jurisdiction of the RWQCB. The time frame for resolving the Navy's request is, however, not known. This Work Plan proposes the collection and analysis of soil and groundwater samples to assess possible impact from these ASTs.	Decisions regarding AST/UST SWMUs will be based on evaluation of the analytical results generated from targeted samples. These data will be used to make the following decision. • Are contaminants present in soil or groundwater that indicate releases from the AST/UST SWMUs? Soil and groundwater data targeting the AST/UST SWMUs will be combined with other area-specific data to evaluate the nature and extent of contamination and will be used to make the following decision. • Have the nature and extent of contamination been defined?	Data inputs will be chemical data, including concentrations of target analytes in soil and discrete groundwater collected during previous investigations and during the IR Site 35 RI. Constituents in soil and groundwater associated with the AST/UST SWMUs will be compared to the following: • RWQCB ESLs for petroleum-contaminated sites (RWQCB 2005) • U.S. EPA Region 9 or California-modified residential PRGs for soil (U.S. EPA 2004) • Alameda Point background concentrations for metals in soil and groundwater The Navy and regulatory agencies have initiated discussions to revisit background concentrations and the data set for Alameda Point at a meeting held on October 18, 2005 (DON 2005a). The comparison criteria that will be used in the RI report will reflect any updated agreements reached by the time that the RI report is prepared. • MCLs for contaminants in groundwater None of the AST/UST SWMUs are located near surface water; therefore, groundwater results will not be compared to surface water criteria.	The boundaries associated with AST/UST SWMUs are the following. • The lateral study boundaries will encompass the immediate vicinity of each AST or UST. • The vertical soil boundary will be the vadose zone underlying the immediate vicinity of the AST or UST. • The vertical groundwater boundary for ASTs will be 5 to 10 feet below the water table (to allow for sufficient sample volume); based on excavation samples collected during removal of UST(R)-11, the tank was within 10 feet of ground surface. • The temporal boundary will be determined by the timing of the fieldwork. As agreed by the regulatory agencies in telephone conference calls held on November 14 and 21, fieldwork was initiated on November 29, 2005, before the Work Plan was finalized (DON 2005b).	Soil and discrete groundwater results will be compared to criteria listed in Step 3. If the only contaminants present above comparison criteria are petroleum-related constituents, then the following general decision rules will be applied. • If contaminants are present in soil and groundwater at concentrations below RWQCB ESLs for petroleum-contaminated sites, then no further action will be recommended. • If contaminants are present in soil or groundwater at concentrations above RWQCB ESLs for petroleum-contaminated sites, then the AST or UST will be recommended for further evaluation under the Alameda Point TPH Program. If nonpetroleum contaminants are present, then the following general decision rules will be applied regarding nature and extent. • If the nature and extent of contamination have been defined (based on comparison criteria in Step 3), then no further assessment will be recommended. • If the extent of contamination has not been defined, and data are not sufficient to support performing an FS, then further delineation will be recommended. If follow-up delineation is performed, results will be submitted in an RI addendum. • If the extent of contamination has not been defined, but data are sufficient to support performing an FS (if there are sufficient data available to assess the nature and magnitude of contamination), then the AST or UST SWMU will be carried forward to the FS. Further delineation may be recommended to support a removal action or inclusion as a component of remedial alternatives in the FS.	Site-specific sampling objectives limit the use of statistical methods for selecting sampling locations to target AST/UST SWMUs. Judgmental sampling has been chosen by the Navy and regulatory agencies to further assess whether soil or groundwater has been impacted by possible releases from these SWMUs. Because judgmental sampling will be used, statistical limits on decision errors are not quantifiable. The most severe study decision error would be to conclude that action is not required when an unacceptable level of human-health risk actually exists. Data collected during the RI will be evaluated conservatively.	The sampling design was developed to generate data to meet the DQOs and in accordance with regulatory agency requests. Soil and discrete groundwater samples will be collected (using direct-push sampling method) from one boring at each AST and two borings at the UST. The borings will be adjacent to and on the estimated downgradient side (where possible) of each AST and the UST; soil samples will be collected at two depths from each boring (0 to 2 and 2 to 4 feet bgs). The groundwater sample will be collected (using a HydroPunch or an equivalent sampling method) from the soil borings at a depth of approximately 5 to 10 feet below the groundwater table. Soil and discrete groundwater samples will be analyzed for the following chemicals, as agreed to by the Navy and regulatory agencies: • VOCs, using U.S. EPA Methods 5035A and 8260B • TPH, using U.S. EPA Method 8015B-M for extractable-range hydrocarbons Additionally, proposed samples targeting UST(R)-11 will also be analyzed for the following: • TPH, using U.S. EPA Method 8015-M for purgeable-range hydrocarbons • metals, using U.S. EPA Method 6010B/7000 Series Groundwater samples will also be analyzed for TDS using U.S. EPA Method 160.1, if sufficient volume can be obtained.

Table 1-4 (continued)

Acronyms/Abbreviations:
AST – aboveground storage tank
bgs – below ground surface
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
DQO – data quality objective
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
EDC – economic development conveyance
ESL – environmental screening level
FS – feasibility study
IR – Installation Restoration (Program)
RI – remedial investigation
RWQCB – (California) Regional Water Quality Control Board
SWMU – solid waste management unit
TDS – total dissolved solids
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
UST – underground storage tank
VOC – volatile organic compound

Table 1-5
IR Site 35 Sampling Program

Study Area	EBS Parcel	Description of Boring Locations [Boring No.]	Total No. of Sampling Locations	NO. OF SAMPLES PER MEDIUM		ANALYSES FOR SOIL SAMPLES U.S. EPA Method											ANALYSES FOR GW SAMPLES U.S. EPA Method											Soil Sampling Depth Intervals[c] (feet bgs)	Rationale
				Soil	GW	VOCs 5035A/ 8260B	TPH-gas 8015-M	TPH-ff 8015B-M	SVOCs (no PAHs) 8270C	PAHs 8270C SIM	Pest 8081A	PCBs 8082	Metals 6010B/ 7000	Hex Chrom 7196A	Lead ICP	Geotech[a]	VOCs 5035A/ 8260B	TPH-gas 8015-M	TPH-ff 8015B-M	SVOCs (no PAHs) 8270C	PAHs 8270C SIM	Pest 8081A	PCBs 8082	Metals 6010B/ 7000	Hex Chrom 7196A	Mercury 1631	TDS[b] 160.1		
AOCs																												
AOC 1	43	Adjacent to OWS-063A and -C [A01SB02-B03]	2	6	2	6		6									2		2								2	0-2, 2-4, 10-12	Assess possible releases from OWS. OWS-063A and -063C extended to 10 feet bgs; therefore, the deepest samples from the adjacent borings will be collected from 10-12 feet bgs.
		Adjacent to OWS-063B [A01SB01]	1	3	1	3		3									1		1								1	0-2, 2-4, 4-8	
Total AOC 1			**3**	**9**	**3**	**9**		**9**									**3**		**3**								**3**		
AOC 2[d]	61A, 194	Around Bldg. 562 [A02SB01-B04]	4	12	2	12			12	12	12	12	12			2	2			2	2	2	2	2[e]		2	2	0-2, 2-4, 4-8	Assess whether there have been releases from possible hazardous waste storage.
AOC 3	91	In the area of EBS sample 091-0001 [A03SB01-03]	3	6							6																	0-2, 2-4	Assess extent of pesticides in soil and address regulatory request regarding GW.
		At the three borings closest to EBS sample 091-0001 [A03SB04-B06]	3	9	3						9											3[f]						0-2, 2-4, 4-8	GW samples will be extracted and held by the laboratory; they will be analyzed if pesticides are reported in the deepest soil samples.
Total AOC 3			**6**	**15**	**3**						**15**											**3**							
AOC 4	97	NA																										0-2, 2-4	No sampling; existing analytical results sufficient for risk assessment.
AOC 5	98	Around sewage pump station; GW samples from northernmost borings [A05SB01-B04]	4	12	2	12			12	12	12	12	12				2			2	2	2	2	2			2	0-2, 2-4, 4-8	Assess possible releases from Bldg. 493 sewage pump station.
AOC 6	87	West of Building 553 [A06SB01-B06]	6	12							12																	0-2, 2-4	Assess possible PCBs in soil.
AOC 7	98	NA																										0-2, 2-4	No sampling; existing analytical results sufficient for risk assessment.
AOC 8	98	In area of EBS soil sample with elevated PCBs (around former sample location 098-0006) [A08SB01-B05]	5	10							10																	0-2, 2-4	Assess extent of PCBs in soil.
AOC 9	80, 81	AOC 9 near IR Site 8 [A09SB01-B03]	3	9							9																	0-2, 2-4, 4-8	Assess pesticides in soil and assess whether GW has been impacted by possible releases from the grease trap.
		Adjacent to grease trap [A09SB04]	1	3	1			2[g]			3						1										1	0-2, 2-4, 4-8	
Total AOC 9			**4**	**12**	**1**			**2**			**12**						**1**										**1**		
AOC 10	98	Area outside lead removal area [A10SB01-B05]	5	15												15												0-2, 2-4, 4-8	Assess lead concentrations in soil outside of lead removal area.
AOC 11[d]	77	Around and downgradient side of former Bldg. 101 (GW samples from northernmost locations) [A11SB01-B03]	4	12	2	12			12	12	12	12	12			2	2			2	2	2	2	2			2	0-2, 2-4, 4-8	Assess whether chemical storage and staining observed at Bldg. 101 impacted soil and GW.
AOC 12	105, 106, 107	Area outside lead removal area [A12SB01-B14]	14	42												42												0-2, 2-4, 4-8	Assess lead concentrations in soil outside of lead removal area.
		Sediment samples [A12S01-S02]	2	2[h]												2												surface	In response to comments, two sediment samples will be collected and analyzed for lead to assess whether lead-containing soil may have entered the storm sewer system during the removal action at this AOC. One sample will be collected from a catch basin at AOC 12; a second sample will be collected from a catch basin or storm sewer line between AOC 12 and Seaplane Lagoon.
Total AOC 12			**16**	**44**												**44**													

Table 1-5
IR Site 35 Sampling Program

Study Area	EBS Parcel	Description of Boring Locations [Boring No.]	Total No. of Sampling Locations	NO. OF SAMPLES PER MEDIUM		ANALYSES FOR SOIL SAMPLES U.S. EPA Method											ANALYSES FOR GW SAMPLES U.S. EPA Method											Soil Sampling Depth Intervals[c] (feet bgs)	Rationale
				Soil	GW	VOCs	TPH-gas	TPH-ff	SVOCs (no PAHs)	PAHs	Pest	PCBs	Metals	Hex Chrom	Lead	Geotech[a]	VOCs	TPH-gas	TPH-ff	SVOCs (no PAHs)	PAHs	Pest	PCBs	Metals	Hex Chrom	Mercury	TDS[b]		
AOCs						5035A/ 8260B	8015-M	8015B-M	8270C	8270C SIM	8081A	8082	6010B/ 7000	7196A	ICP		5035A/ 8260B	8015-M	8015B-M	8270C	8270C SIM	8081A	8082	6010B/ 7000	7196A	1631	160.1		
AOC 13	103	In area of EBS locations 103-0002, 103-0020, and 103-0023 [A13SB01-B06]	6	12							12																	0-2, 2-4	Assess extent of pesticides in soil at EBS locations 103-0002, 103-0020, and 103-0023.
		Sample closest to EBS location QQ25 [A13SB07]	1	2						2	2																	0-2, 2-4	Assess concentrations of pesticides and PAHs in soil in area of QQ25.
Total AOC 13			7	14						2	14																		
AOC 14	103	NA																											No sampling; existing PAH analytical results sufficient for RI/FS.
AOC 15[d]	102	Around Bldg. 102 [A15SB01-B03]	3	9						9																		0-2, 2-4, 4-8	Asses extent of PAHs in soil.
AOC 16	103	NA																											No sampling; existing PAH analytical results sufficient for RI/FS.
AOC 17[d]	185	Northern, central, and southern portions of AOC [A17SB01-B03]	3	9	3	9		9					9	9			3		3					3	3		3	0-2, 2-4, 4-8	Assess whether soil and GW have been impacted by VOCs, TPH, and metals from previous site activities.
AOC 18[d]	70	West of Bldg. 39[i] and downgradient side of AOC 18; GW samples from southernmost (downgradient) locations [A18SB01-B04]	4	12	2	12	12	12	12	12	12	12	12		2		2	2	2	2	2	2	2	2			2	0-2, 2-4, 4-8	Assess whether possible releases from storage of hazardous wastes in the area west of Bldg. 39 impacted soil or GW.
AOC 19	195	NA																											OWS and any outstanding characterization issues to be addressed under IR Site 6 FS. AOC removed from IR Site 35.
AOC 20	23F	Adjacent to and downgradient of OWS 12A and 12B [A20SB01-B02]	2	6	2	6		6					6				2		2					2[e]		2	2	0-2, 2-4, 4-8	Assess whether soil and/or GW have been impacted by possible leaks from the two OWSs.
AOC 21	23F	Downgradient of EBS samples 023-0051 and 0054 [A21SB01-B02]	2	6	2	6											2										2	0-2, 2-4, 4-8	Assess the distribution of VOCs in GW from previous site activities and confirm that concentrations are below MCLs.
AOC 22	23F	NA																											Any outstanding characterization issues will be addressed under CAA-B. AOC removed from IR Site 35.
AOC 23[d]	71	Within WD-041B [A23SB01-B02]	2	6	2	6	6	6	6	6	6	6	6				2	2	2	2	2	2	2	2			2	0-2, 2-4, 4-8	Assess whether possible releases from the washdown area impacted soil or GW.
		South of former washdown area [A23SB03]	1	3	1	3	3	3	3	3	3	3	3					1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Provide wider coverage of samples.
		South of sample B06-09 [A23SB04]	1	3	1	3				3			3				1				1			1			1	0-2, 2-4, 4-8	Assess the distribution of VOCs and PAHs and confirm iron concentrations in soil and the possible impact to GW.
		Southern portion of the parcel [A23SB06]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1[e]		1	1	0-2, 2-4, 4-8	Provide wider coverage of samples.
		Southeastern portion of the parcel at sample 071M-004 [A23SB05]	1	3	1	3				3							1				1						1	0-2, 2-4, 4-8	Confirm the presence of elevated PAHs in GW and benzene in soil.
	72	West of Bldg. 77 [A23SB07]	1		1												1										1	NA	Assess the impact, if any, of VOCs in GW from IR Site 6.
	110	North of Bldg. 271 [A23SB08]	1		1												1	1	1	1	1	1	1	1			1	NA	Assess possible impact from chemicals stored in or around Bldg. 271.
		Within stained area west of Bldg. 271 used for storage and on the downgradient side [A23SB13]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	
		Beneath Bldg. 271 [A23SB40]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1				0-2, 2-4, 4-8	
		Within stained area east of Bldg. 271 [A23SB10]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	
		South of Bldg. 271 [A23SB11]	1		1												1	1	1	1	1	1	1	1			1	NA	

Table 1-5
IR Site 35 Sampling Program

Study Area	EBS Parcel	Description of Boring Locations [Boring No.]	Total No. of Sampling Locations	NO. OF SAMPLES PER MEDIUM		ANALYSES FOR SOIL SAMPLES U.S. EPA Method											ANALYSES FOR GW SAMPLES U.S. EPA Method											Soil Sampling Depth Intervals[c] (feet bgs)	Rationale
				Soil	GW	VOCs	TPH-gas	TPH-ff	SVOCs (no PAHs)	PAHs	Pest	PCBs	Metals	Hex Chrom	Lead	Geotech[a]	VOCs	TPH-gas	TPH-ff	SVOCs (no PAHs)	PAHs	Pest	PCBs	Metals	Hex Chrom	Mercury	TDS[b]		
AOCs						5035A/ 8260B	8015-M	8015B-M	8270C	8270C SIM	8081A	8082	6010B/ 7000	7196A	ICP		5035A/ 8260B	8015-M	8015B-M	8270C	8270C SIM	8081A	8082	6010B/ 7000	7196A	1631	160.1		
AOC 23[d] (cont.)	110 (cont.)	Southwest portion of Parcel 110 [A23SB12]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Provide wider coverage of samples.
		Downgradient of industrial waste pump station [A23SB09]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Assess whether possible contaminants from the pump station impacted soil or GW.
	121	EBS Parcel 121 [A23SB14]	1	3	1	3	3	3	3	3	3	3	3			2	1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Provide wider coverage of samples.
	123	North of NAS GAP 29 [A23SB15-B16]	2	6	1							6	6										2	2			2	0-2, 2-4, 4-8	Assess PCBs in soil and address regulatory request to target this area for GW evaluation.
		South of NAS GAP 29 [A23SB17]	1		1															1	1	1	1	1			1	NA	Assess PCBs in GW south of NAS GAP 29 and possible contaminants north of Bldg. 263.
		Northwestern portion [A23SB18]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Provide wider coverage of samples in the parcel and assess soil and GW quality north of Bldg. 98, west of Bldg. 263, and east of Bldg. 13 (EBS Parcel 124).
		Downgradient of Bldg. 263 [A23SB19]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Address the presence of contaminants in addition to TPH. Also provides information north of Bldg. 263.
		West of Bldg. 98 [A23SB20]	1		1												1	1	1	1	1	1	1	1			1		Assess whether possible releases at Bldg. 98 impacted soil or GW and provide wider coverage of samples east of Bldg. 98. The two westernmost borings also provide information east of Bldg. 13 (EBS Parcel 124).
		East of Bldg. 98 [A23SB21]	1	3	1	3	3	3	3	3	3	3	3					1	1	1	1	1	1	1			1		
		Downgradient of Bldg. 98 [A23SB22]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	
		Adjacent to NAS GAP 15 [A23SB23-B24]	2		2												2	2	2	2	2	2	2	2			2	NA	Address regulatory request to target this area to assess NAS GAP 15.
		Between Bldgs. 67 and 393 [A23SB25]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Assess stained area between Bldgs. 67 and 393.
		Adjacent to OWS 067 [A23SB26]	1	3	1	3	3	3					3				1	1	1					1			1	0-2, 2-4, 4-8	Assess whether possible releases from OWS-067 impacted soil or GW.
		Adjacent to UST(R)-11 [A23SB27-B28]	2	6	2	6		6					6				2		2					2			2	0-2, 2-4, 4-8	Assess current conditions.
		East portion of EBS Parcel 123 [A23SB29]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1			1	0-2, 2-4, 4-8	Provide wider coverage of samples.
	124	Around Bldg. 13; north and southwest of Bldg. 13 (GW only); west of Bldg. 13 (GW and soil) [A23SB30-B32]	3	3	3	3	3	3	3	3	3	3	3				3	3	3	3	3	3	3	3[j]		2	3	0-2, 2-4, 4-8	Assess whether chemicals stored in Bldg. 13 impacted soil or GW.
	125	North, west, and south of Bldg. 66 [A23SB33-B35]	3	9	3	9	9	9	9	9	9	9	9				3	3	3	3	3	3	3	3[e]		3	4	0-2, 2-4, 4-8	Assess whether possible releases at Bldg. 66 impacted soil or GW.
		Beneath Bldg. 66 [A23SB39]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1[e]		1		0-2, 2-4, 4-8	
		Adjacent to and downgradient of NADEP GAP 43 [A23SB36]	1	3	1	3	3	3	3	3	3	3	3				1	1	1	1	1	1	1	1[e]		1	1	0-2, 2-4, 4-8	
	126	Northern and southern portion of parcel [A23SB37-B38]	2	3	2	3							3			2	2							2[e]		2	2		Assess the distribution of metals and VOCs in soil and GW.
		A23398-MW1 [A23W01]	1		1												1							1[e]		1	1		
Total AOC 23			41	90	40	84	69	75	66	72	66	72	87			4	36	30	32	30	32	30	32	39		11	40		
AOC 24	197	Adjacent to OWS 118 [A24SB01]	1	3	1	3		3					3				1		1					1			1	0-2, 2-4, 4-8	Confirm previous soil data and assess whether GW has been impacted by possible releases. Metals in soil and GW in the western portion of AOC 24 will be addressed in the IR Site 3 remedial action/remedial design.

Table 1-5
IR Site 35 Sampling Program

Study Area	EBS Parcel	Description of Boring Locations [Boring No.]	Total No. of Sampling Locations	NO. OF SAMPLES PER MEDIUM		ANALYSES FOR SOIL SAMPLES U.S. EPA Method											ANALYSES FOR GW SAMPLES U.S. EPA Method											Soil Sampling Depth Intervals[c] (feet bgs)	Rationale
				Soil	GW	VOCs	TPH-gas	TPH-ff	SVOCs (no PAHs)	PAHs	Pest	PCBs	Metals	Hex Chrom	Lead	Geotech[a]	VOCs	TPH-gas	TPH-ff	SVOCs (no PAHs)	PAHs	Pest	PCBs	Metals	Hex Chrom	Mercury	TDS[b]		
AOCs						5035A/ 8260B	8015-M	8015B-M	8270C	8270C SIM	8081A	8082	6010B/ 7000	7196A	ICP		5035A/ 8260B	8015-M	8015B-M	8270C	8270C SIM	8081A	8082	6010B/ 7000	7196A	1631	160.1		
AOC 25	130, 132	Three borings north of Bldg. 503 for soil and GW; one boring in southeast portion of AOC for GW only [A25SB01-B04]	4	9	4								9					4	4					4			4	0-2, 2-4, 4-8	Assess the distribution of metals (notably thallium) north of Bldg. 503, and TPH in GW in the southwestern portion of the AOC.
AOCs Total			**124**	**311**	**67**	**165**	**81**	**116**	**114**	**131**	**155**	**142**	**162**	**9**	**59**	**10**	**55**	**36**	**48**	**38**	**40**	**41**	**40**	**57**	**3**	**15**	**64**		
Data Gap Sites																													
EBS Parcel 78	78	Grid pattern across site [D78SB01-B04]	4	12	4	12	12	12	12	12	12	12	12				4	4	4	4	4	4	4	4			4	0-2, 2-4, 4-8	Data gap; agency requested.
EBS Parcel 79	79	Grid pattern across site [D79SB01-B04]	4	12	4	12	12	12	12	12	12	12	12				4	4	4	4	4	4	4	4			4	0-2, 2-4, 4-8	Data gap; agency requested.
EBS Parcel 205	205	East of Bldg. 523 on downgradient side of NADEP GAP 73 [D205SB01-B02]	2	6	2	6	6	6					6				2	2	2					2[e]		2	2	0-2, 2-4, 4-8	Assess whether soil and GW have been impacted by possible releases from this GAP.
Data Gap Sites Total			**10**	**30**	**10**	**30**	**30**	**30**	**24**	**24**	**24**	**24**	**30**				**10**	**10**	**10**	**8**	**8**	**8**	**8**	**10**		**2**	**10**		
SWMUs																													
SWMU OWS 017	80	Adjacent to and downgradient of SWMU [S017SB01]	1	2	1	2		2					2				1		1								1	0-2, 2-4	Assess oil trap and metals in GW.
SWMU AST 016	83	Adjacent to and downgradient of SWMU [S016SB01]	1	2	1	2		2									1		1								1	0-2, 2-4	Assess whether chemicals from AST impacted soil and/or GW.
SWMU AST 039	70	Adjacent to (if possible) and downgradient of SWMU [S039SB01]	1	2	1	2		2									1		1								1	0-2, 2-4	Assess whether chemicals from AST impacted soil and/or GW.
SWMU AST 152	102	Adjacent to SWMU [S152SB01]	1	2	1	2		2									1		1								1	0-2, 2-4	Assess whether chemicals from AST impacted soil and/or GW.
SWMU AST 173A/B/C	115	Adjacent to middle of AST-173B [S173SB01]	1	2	1	2		2									1		1								1	0-2, 2-4	Assess whether chemicals from AST impacted soil and/or GW.
SWMU AST 392	189	Adjacent to and downgradient of SWMU [S392SB01]	1	2	1	2		2									1		1								1	0-2, 2-4	Assess whether chemicals from AST impacted soil and/or GW.
SWMU UST(R)-11	NA[k]																												
SWMUs Total			**6**	**12**	**6**	**12**		**12**					**2**				**6**		**6**								**6**		
PAH Areas	NA																												Assess lead in sediment from sandblasting of towers.
TOTALS			**140**	**353**	**83**	**207**	**111**	**158**	**138**	**155**	**179**	**166**	**194**	**9**	**59**	**10**	**71**	**46**	**64**	**46**	**48**	**49**	**48**	**67**	**3**	**17**	**80**		No sampling; existing analytical results sufficient for RI/FS.

Notes:
- [a] see Table 2-2 in the SAP for geotechnical analytical methods
- [b] GW samples will be collected for TDS analysis if sufficient sample volume can be collected from the boring
- [c] GW samples will be collected from approximately 5 to 10 feet below the water table to allow for sufficient sample volume
- [d] two soil samples will be collected from one boring at this AOC to be analyzed for geotechnical analyses as specified in Table 2-1 of the SAP
- [e] does not include mercury
- [f] extract and hold all GW samples from these locations, pending results of the deepest soil samples from these three borings
- [g] the lower two soil samples from the boring next to the grease trap on downgradient side will also be analyzed for TPH
- [h] sediment samples from catch basins and/or storm sewer lines
- [i] borings will be located near drains, if identified
- [j] does not include mercury for those samples also being analyzed for low-detection-limit mercury under separate analysis
- [k] UST(R)-11 addressed under AOC 23

Acronyms/Abbreviations:
- AOC – area of concern
- AST – aboveground storage tank
- bgs – below ground surface
- Bldg. – building
- CAA – corrective action area
- EBS – environmental baseline survey
- FS – feasibility study
- GAP – generator accumulation point
- GW – groundwater
- IR – Installation Restoration (Program)
- MCL – maximum contaminant level
- NA – not applicable
- NADEP – Naval Aviation Depot
- NAS – Naval Air Station
- OWS – oil/water separator
- PAH – polynuclear aromatic hydrocarbon
- PCB – polychlorinated biphenyl
- Pest – pesticide(s)
- SAP – sampling and analysis plan
- SVOC – semivolatile organic compound
- SWMU – solid waste management unit
- TPH – total petroleum hydrocarbons (purgeable- and extractable-range, unless otherwise noted)
- UST – underground storage tank
- VOC – volatile organic compound

Table 2-1
Analytical Methods, Containers, Preservation, and Holding Times for Proposed Soil Samples

Analyte	Method	Container	Preservation	Holding Time
VOCs	U.S. EPA 5035A and 8260B	Three 5-gram EnCore or similar airtight sampling devices	Cool 4 ± 2 °C	48 hours
TPH-gasoline	U.S. EPA 8015-M	Three 5-gram EnCore or similar airtight sampling devices	Cool 4 ± 2 °C	48 hours
TPH-ff	U.S. EPA 8015B-M with silica gel cleanup	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
SVOCs (non-PAHs)	U.S. EPA 8270C	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
PAHs	U.S. EPA 8270C SIM	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
TCL pesticides	U.S. EPA 8081A	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
TCL PCBs	U.S. EPA 8082	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
TAL metals	U.S. EPA 6010B/7000 Series	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months; 28 days until extraction for mercury
Hexavalent chromium	U.S. EPA 7196A	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	30 days
Lead	U.S. EPA 6010B ICP	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Mercury	U.S. EPA 7471A	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	20 days
Air permeability	API Recommended Practice 40	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Density and moisture content	ASTM D2937 and D2216	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Effective porosity	SWRCB	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Grain-size distribution	ASTM C136-96 and D422-63	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Liquid limits	ASTM D4318-00	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Hydraulic conductivity	ASTM D5084-90	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months
Total organic carbon	Walkley-Black	6-inch stainless steel, brass, or acetate liner	Cool 4 ± 2 °C	6 months

Acronyms/Abbreviations:
API – American Petroleum Institute
ASTM – American Society for Testing and Materials
°C – degrees Celsius
ff – fuel fingerprint
ICP – inductively coupled argon plasma

Table 2-1 (continued)

Acronyms/Abbreviations: (continued)
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
SIM – selected ion monitoring
SVOC – semivolatile organic compound
SWRCB – (California) State Water Resources Control Board
TAL – target analyte list
TCL – target compound list
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

Table 2-2
Analytical Methods, Containers, Preservation, and Holding Times for Proposed Groundwater Samples

Analyte	Method	Container	Preservation	Holding Time
Laboratory-Measured Parameters				
VOCs	U.S. EPA 8260B	Three 40-mL glass vials with Teflon septa	HCl to pH < 2, cool 4 ± 2 °C, no headspace	14 days
TPH-gasoline	U.S. EPA 8015-M	Three 40-mL glass vials with Teflon septa	HCl to pH < 2, cool 4 ± 2 °C, no headspace	14 days
TPH-ff*	U.S. EPA 8015B-M with silica gel cleanup	Two 1-liter amber glass bottles	Cool 4 ± 2 °C	14 days
SVOCs (non-PAHs)	U.S. EPA 8270C	Two 1-liter amber glass bottles	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
PAHs	U.S. EPA 8270C SIM	Two 1-liter amber glass bottles	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
TCL pesticides/PCBs	U.S. EPA 8081A and 8082	Two 1-liter amber glass bottles	Cool 4 ± 2 °C	7 days until extraction; 40 days after extraction
TAL metals*	U.S. EPA 6010B/7000 Series	One 1-liter poly bottle	HNO_3 to pH < 2, Cool 4 ± 2 °C	6 months; 28 days until extraction for mercury
Hexavalent chromium	U.S. EPA 7196A	One 250-mL poly bottle	Cool 4 ± 2 °C	24 hours
Mercury	U.S. EPA 1631	One 250-mL fluoropolymer bottle	Cool 4 ± 2 °C	28 days
TDS*	U.S. EPA Method 160.1	One 500-mL poly bottle	Cool 4 ± 2 °C	7 days

Note:
* samples will be analyzed for dissolved metals; they will be filtered in the field

Acronyms/Abbreviations:
°C – degrees Celsius
ff – fuel fingerprint
HCl – hydrochloric acid
HNO_3 – nitric acid
mL – milliliter
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
poly – polyethylene
SIM – selected ion monitoring
SVOC – semivolatile organic compound
TAL – target analyte list
TCL – target compound list
TDS – total dissolved solids
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound